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# CANADIAN MINING JOURNAL

VOL. XXXVII TORONTO No. 13

*In this issue:*

*The Rognon Flotation*

*Iron Mines of Newfoundland*

*Britannia Mining and Smelting Company*

*Flotation Oils*

The Canadian Mining Journal, Purman Bldg., 263-265 Adelaide St. West, Toronto, Ont.

# CANADA
# DEPARTMENT OF MINES

**HON. P. E. BLONDIN, Minister.** **R. G. McCONNELL, Deputy Minister.**

## MINES BRANCH

### Recent Publications

The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1913, by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

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Ceramic Laboratory—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

## GEOLOGICAL SURVEY

### Recent Publications

Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.

Memoir 50. Upper White River District, Yukon, by D. D. Cairnes.

Memoir 56. Geology of Franklin Mining Camp, British Columbia, by C. W. Drysdale.

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 60. Arisaig-Antigonish District, Nova Scotia, by M. Y. Williams.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.

Memoir 68. A Geological Reconnaissance Between Golden and Kamloops, B.C., along the Canadian Pacific Railway, by R. A. Daly.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 78. Wabana Iron Ore of Newfoundland, by A. O. Hayes.

Memoir 79. Ore Deposits of the Beaverdell Map-area, by L. Reinecke.

Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

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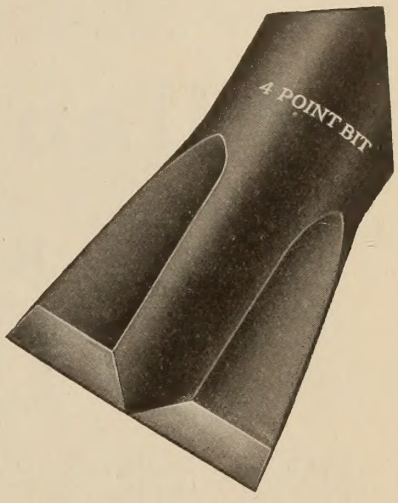
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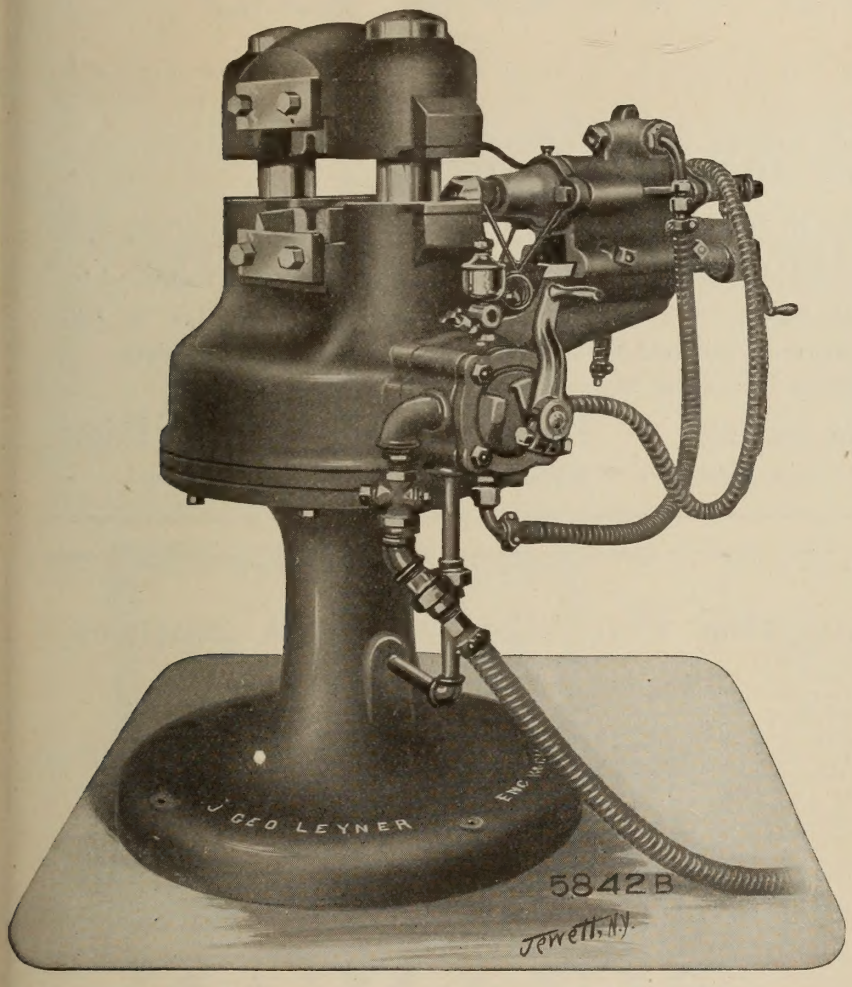
Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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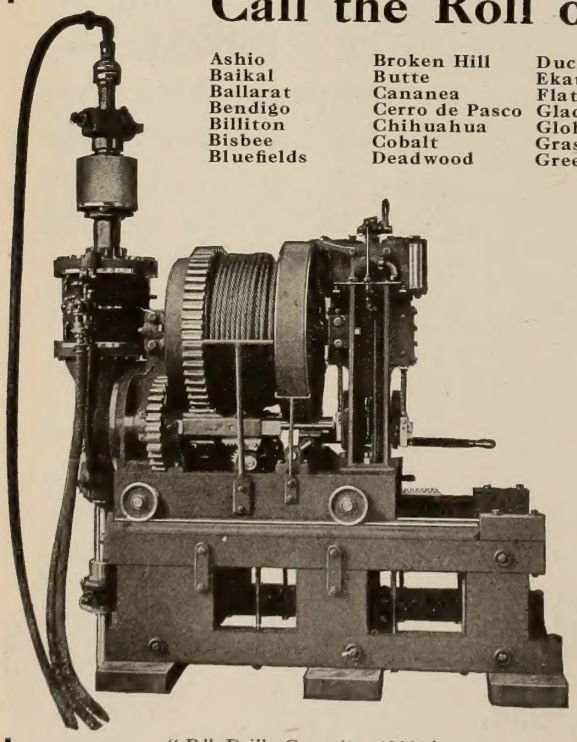
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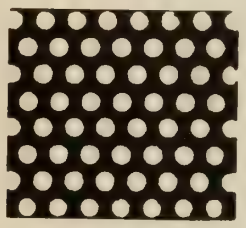
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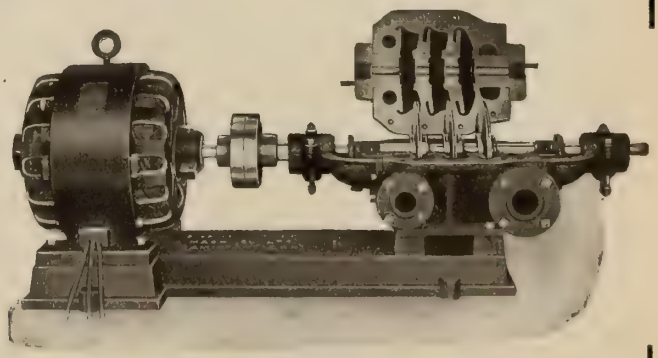
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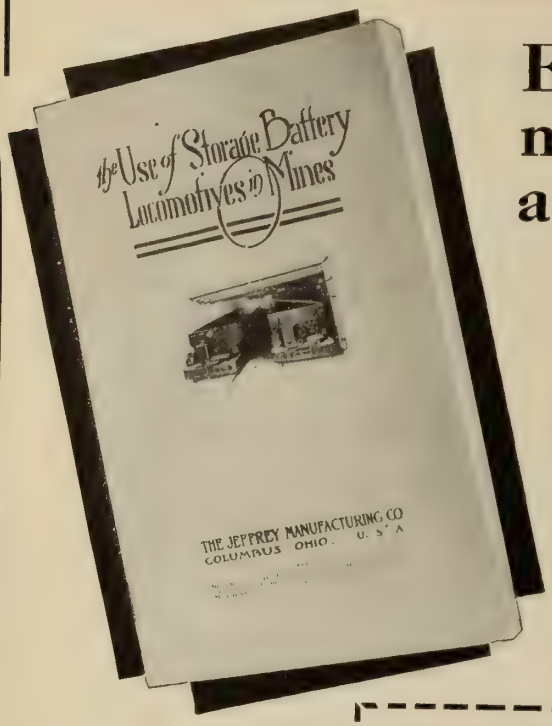
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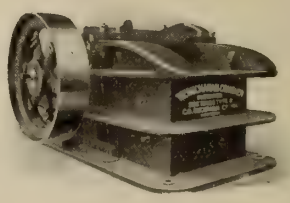
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## The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

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CONTENTS

| | PAGE |
|---|---|
| Editorials— | |
| The Rognon Flotation | 311 |
| A Scientist Recognized | 313 |
| Gibson's Fortnightly Mining Review | 313 |
| Lead and Zinc | 313 |
| Correspondence | 313 |
| Canadian Minerals at Panama-California Exhibition, by F. H. Mason | 314 |
| The Iron Mines of Wabana, Newfoundland, by J. W. McGrath | 315 |
| Flotation Oils, by O. C. Ralston | 318 |
| The Annealing of Nickel-Silver | 320 |
| Britannia Mining and Smelting Company, Ltd | 323 |
| Personal and General | 327 |
| Special Correspondence | 328 |
| Markets | 334 |

## THE ROGNON FLOTATION

The gold mining industry of Ontario has during the past few years made rapid strides. Several very profitable mines have been developed and the known gold bearing area has been greatly extended. Many promising discoveries have been made, and it is reasonable to expect that the number of profitable mines will greatly increase in the near future. The results obtained from operations in the Porcupine and neighboring districts have been so satisfactory that we may confidently expect that Ontario is to become a very large producer of gold for years to come. It is well for Canadians to recognize this fact.

Canadian investors should be encouraged to take the leading part in the development of what promises to be a great and profitable industry. Some of the new discoveries warrant the expenditure of more money than the owners can provide. It is natural that they should form stock companies and appeal to the public to contribute funds and share in the risks. In exchange for stock subscriptions the company promoters should give the public a fair deal. Those who are asked to contribute money for the development of prospects should be told all the facts. Those who propose to contribute should investigate carefully. There are risks in mining ventures which should be recognized, and which the investor must take. There are also risks of another character which no sensible investor should take and which unfortunately are the cause of most of the losses in connection with mining company promotions.

During the past few years the number of wildcat mining promotions in Canada, as compared with those of the early days of Cobalt, has been small; there has been more money spent in mining operations and less absorbed by parasites; and as a result the mining industry is now in a flourishing condition. Thousands of shareholders of stock in Canadian mining companies are receiving good dividends and fewer worthless certificates are being printed.

Recently the public has been taking more notice of the excellent results being obtained by companies operating gold mines in Ontario. It is to be expected therefore that many investors would be willing to take part in the financing of promising properties. It will be unfortunate and to the discredit of those who take part in flotations if these prospective investors are deluded into taking foolish and unnecessary chances.

There has come to our attention since the publication of our last issue the prospectus of the Rognon Gold

Mines, Ltd.; a company formed ostentatiously for the development of a gold deposit near Dryden, Ontario.

What the actual value of the property is no one can say. Many who have examined it regard it as well worthy of development. Mr. Frank C. Loring of Toronto, Mr. R. T. Cornell of Ricketts & Co., New York, and Mr. James Bartlett, of the Ontario Bureau of Mines staff, have examined the property and they report favorably on the surface showings. There is some high-grade ore, and there may be a lot of it. Under the circumstances a good price might reasonably be demanded, provided the prospective buyer were given an opportunity of thoroughly testing the property before exercising his option. Without being permitted to first do some development work, few experienced mining men would consider paying $50,000 for a very promising undeveloped gold property. Assuming some such price as the present market value of the Rognon prospect let us turn to the Rognon prospectus.

The prospectus shows that the directors of the Rognon Gold Mines, Limited, are J. E. Murphy, A. D. Clark, A. G. Kirby and Samuel J. Maddin, of Toronto, and Ernest J. Rognon, of Dryden, Ontario. The consulting engineer is Mr. P. Kirkegaard, of Toronto. Mr. Rognon is the discoverer of the property, and president of the Dryden Board of Trade. The Toronto gentlemen are well and favorably known. The list of directors is such as to inspire confidence.

The literature inviting subscriptions is being sent out by the Ontario Bond Corporation, Ltd., a company incorporated in Toronto on May 20, 1916, with a capital of $40,000, "to carry on a financial and mining business and to buy, sell and deal in shares, bonds, debentures and securities of all kinds." The moving spirit is Mr. A. G. Penman, of Toronto, who has had some previous experience in the financing of mining companies, being associated with the flotation of the Otisse and Cobalt Silver Mountain companies some years ago. He is credited with being a salesman of great ability, and has, since his Cobalt ventures, been successfully selling real estate.

The capitalization of Rognon Gold Mines, Limited, is $2,500,000. The par value of the shares is $1. There has been issued to each of the four vendors of the property, Ernest G. Rognon, Melvina B. Rognon, Peter Kirkegaard and Samuel Maddin, 500,000 shares, making a total of 2,000,000 shares paid for the property. Of the remaining 500,000 shares, called treasury shares, 100,000 is now offered to the public at par.

From this it might be deduced that the promoters consider that $100,000 is the sum required to develop the property. They appeal to the public for the necessary funds. In exchange for the money, which is to be the entire working capital, they offer 100,000 shares, while the vendors get 2,000,000 shares. Any earnings from the $100,000 subscribed by the public would be divided between holders of vendors' and treasury shares in the ratio of twenty to one.. If the operation of the mine proved very profitable and yielded a net profit of say $1,050,000 during the life of the mine, the buyers of the 100,000 shares of treasury stock would be entitled to $50,000, while the holders of the 2,000,000 vendors' shares would get the $1,000,000.

Now such a share of profits can scarcely be expected to induce even the most careless investor. Such an offer might be expected to be unsuccessful and scarcely worthy of notice. The Rognon promoters have, however, provided another feature. Not content with offering the public such a handsome share of the possible profits, the Rognon promoters announce that they have entered into an agreement with the Imperial Trusts Co. whereby the money subscribed by the public will be returned at the end of fifteen years, without interest, if the mining company does not make a profit of several million dollars in that time. This arrangement is called a guarantee and much attention is directed to it by the promoters. This guarantee feature is not new. It is frequently used successfully in selling property that would be unsaleable without the addition of some special features.

To the promoters of the Rognon the guarantee feature doubtless appealed as one which would give investors more confidence. To utilize it without cost to themselves they propose to sell to the public more shares than would otherwise be necessary so that part of the money can be deposited with the Trust Company so that a guarantee can be given that an amount equal to that subscribed will be returned at the end of fifteen years. As $100,000 is wanted for the treasury and a similar sum will be needed for deposit with the Trust Company it will be necessary to sell about 200,000 shares. To pay the expenses of organizing and selling, more shares must be sold. The public will, under this plan, provide the money necessary for the treasury and to pay the Trust Company for its guarantee. The vendors will contribute no money but will part with about 100,000 shares of their 2,000,000 shares to obtain the necessary funds for the guarantee. What agreement exists between the vendors, the mining company, the Trust company and the promoters, the public is not supposed to enquire. The Provincial Secretary would do well to investigate.

The prospectus states that an option on 100,000 shares of treasury stock granted to the Ontario Bond Corporation and a contract of employment of an engineer are the "only material contracts." If that is so we would be very much surprised. It would indicate a scarcely credible laxity on the part of the Imperial Trust Company.

Money must be paid the Imperial Trust Company for its guarantee. Money must be paid the Ontario Bond Corporation for its services. The money is to be supplied by the public, and yet we are told that the contracts between the Trust company, the salesmen and the vendors are not material contracts.

The Ontario Bond Corporation in calling attention to its guarantee feature points out that even if the mine proves unprofitable and even if the $100,000 is spent without any return the purchasers of shares will, at the end of fifteen years get their money back.

The salesmen thus put their case in a nutshell. They get their profit, the Imperial Trust Company gets the use of the money and the vendors have an opportunity of disposing of their shares at a big figure, whether the property is of any value or not.

If the property should happen to prove profitable those who furnish the $100,000 will share in the profits. They will be entitled to a ridiculously small fraction, however. For each dollar they get, the holders of vendors' shares will be entitled to twenty.

## A SCIENTIST RECOGNIZED

Honors for scientific services in Canada are so seldom bestowed that the recognition of the services rendered by Frederick Stupart, Director of the Meteorological Service, is an event of no ordinary significance. We congratulate Sir Frederick. His work is well known to be of a high order and the services he has rendered the public are great. It is therefore fitting that this distinguished scientist should be honored. It is to be hoped that the recognition of the services of this scientist is to be taken as an indication that the amassing of wealth and the attaining of high political office are no longer to be regarded as the only forms of public service worthy of recognition. Few of those who have devoted their lives to scientific work in the service of the Government have received their just reward. Possibly the awakening of the public to the fact that scientific research should be encouraged may eventually result in scientists being not so scarce in the lists of those receiving honors.

## GIBSON'S FORTNIGHTLY MINING REVIEW

About three months ago we received the first copy of "Gibson's Fortnightly Mining Review," published by Homer L. Gibson & Co., commission stock brokers, and sent free of charge to mining investors. It bore evidence of being carefully edited, contained much information that seemed likely to be useful to investors, and was free from the sensational statements which characterize the literature sent out by some brokers.

Subsequent issues of the Review indicate that the publishers intend to keep up the high standard set by the first issue. They may rightly claim that they are rendering a real service to mining investors.

The latest issue of the Review contains a general article on mining in Northern Ontario that should be read by Canadian investors.

## LEAD AND ZINC

A timely report on the lead and zinc deposits of Ontario and Quebec has just been issued by the Ontario Bureau of Mines. The report was prepared by Mr. W. L. Uglow, who, during 1914 and 1915, was employed by private interests in making a study of the deposits.

Mr. Uglow has, through the Ontario Bureau of Mines, given to the public information that should help in the development of the lead and zinc mining industry. He has described, after carefully reading all the available literature, most of the important deposits and a number of prospects which he has visited. As a summary of what is known of the nature of the deposits the report will doubtless be much used.

## CORRESPONDENCE

To the Editor Canadian Mining Journal:

Sir,—I wish to call your attention to a note in your last issue, which is apt to cause a little misunderstanding. You state that the charter for the Laurentian Consolidated mine has been changed to the Rognon Gold Mines Limited.

I wish to inform you that the Rognon gold mine has nothing whatever to do with the Laurentian gold mine. Some three years ago a charter was taken out with the name Hunton Gold Mine. This was never used, and the name was afterwards changed to Laurentian gold mine. It was never used in this instance also and, when the organizers of the Rognon Gold Mines Limited were preparing to incorporate, they heard that the charter was for sale, and, consequently, purchased it at a lesser cost than would have been necessary had they gone to the Government for a new charter.

Trusting you will explain this matter in your next issue, and assuring you that neither the Rognon Gold Mines Limited, nor any of the men associated with it have, or ever had, anything to do with the Laurentian property, I am, yours faithfully,

A. G. PENMAN.

Toronto, June 21, 1916.

### INDIAN PLACE NAMES.

Many of the lakes, rivers, etc., of Northern Canada are known by names given them by the Indians, or by names derived from the Indian names. In a paper read before the Royal Canadian Institute, Toronto, Mr. J. B. Tyrrell gives a collection of Algonquian Indian names in Northern Canada, their meaning, the location of the places to which they apply, and the name by which these places are now known.

The Pas, a place which has recently become of importance to mining men, was known to the Indians as Opa: a narrow place, or Opaskweow: narrows between two high places. Athapapuskow lake, in The Pas Mining district, was known as Athapapuskow Sakahigan: rock-on-both-sides-lake. The Saskatchewan river was Kisiskatchewana Sipi: swift current river. Manitoba lake was Manitoba Sakahigan: Manito (or spirit) narnows lake. Lake Winnipeg was called by the Indians Winnipeg Sakahigan or Nasty-water lake.

# CANADIAN MINERALS AT THE PANAMA-CALIFORNIA INTERNATIONAL EXPOSITION

By F. H. Mason.

The Canadian mineral exhibit that caused so much favorable comment at the Panama-Pacific International Exposition is causing almost as much eclat at the Panama-California International Exposition at San Diego. Of course, the latter is a much smaller exposition than, and not nearly as well attended as, the San Francisco Fair, but among the winter visitors to the southern city are people who have money and leisure enough to get away from the rigors of the northern and eastern winters. Capitalists and mining men of Arizona, Colorado, and New Mexico, rich mineral states, are wont to rendezvous in the cool southern coast city during the summer months to get away from the torrid heat of the interior. Just now, it is the silly season, and things are a bit slack, but the members of the mineral department are looking forward to a particularly good summer, and expect to interest many mining men and capitalists in the vast mineral resources of the Dominion of Canada.

With the advent of a metallurgist on the exhibition commission, a number of metallurgical features have been, and are being, added to the mineral exhibit, thus, besides the excellent display shown at San Francisco, the present exhibit contains a number of automobile and bicycle parts plated with cobalt, together with cobalt anodes and the cobalt salts used in electro-plating; a new collection of anodes, cathodes, starting sheets, pig lead, and lead pipe, from the Consolidated Mining and Smelting Co. of Canada, illustrating the very latest practice in electrolytic lead refining at Trail, B.C.; some ore, concentrate, part of a cathode with deposited zinc, and a pig of zinc produced by the Watts electrolytic process, from the Electro-Zinc Company's works at Welland, Ont.; and a splendid collection of that typically Canadian alloy, monel metal, in the form of wire, sheet, and bar, from the International Nickel Co. These exhibits, particularly the cobalted articles, have occasioned a large number of inquiries, many of which will undoubtedly produce good results.

Beside the metallurgical features, a number of new minerals, representing recent discoveries, have been added since the San Francisco Fair. Most noticeable among these are an excellent collection from Kowkash and Boston Creek, obtained through the kindness of Mr. Thomas W. Gibson, Deputy Minister of Mines for Ontario.

# REFINING METALS AT TRAIL, B.C.

The Trail News, published at Trail, British Columbia, on June 9 printed the following:

A few days ago Professor Francis A. Thomson, head of the school of mines at the Washington State College at Pullman, Wash., was a visitor in Trail, with some of the mining students of the college, inspecting the Consolidated smelter here. Unlike most college professors, Prof. Thomson is not verbose, but has the happy faculty of putting much in little and thus getting at the meat of the matter. His comments on the Trail smelter is, therefore, of more than usual interest. Here is what he said:

Trail to-day is one of the metallurgical meccas of America. The other is Anaconda, Montana. But Trail, as soon as the electrolytic copper refinery is built, will be doing what no one plant with which I am acquainted has ever done—that is, producing refined gold, refined silver, refined copper, refined lead and refined zinc.

War times have brought another addition to the Trail smelter in the form of a tall fence with a barb wire guard on top and a Canadian soldier with a fixed bayonet at each gate—a necessary precaution against Teutonic tampering.

Briefly, the Trail smelter consists of three plants. The first is the copper smelter, the successor of the little matting plant built by Heinze in 1895. It treats mainly the gold copper ores of Rossland, as did its predecessor. This plant has a capacity of 1,000 to 1,200 tons of ore daily and makes a low-grade copper matte, which is either resmelted to higher grade or more recently enriched in the newly added converters. Before long all matte will be converted to blister copper, and refined electrolytically at Trail.

The second section of the plant is the lead smelter. Here lead ores, mainly from East Kootenay and the Slocan, are smelted in blast furnaces to lead bullion, also containing gold and silver.

This smelting is preceded in nearly all ores by roasting in Wedge & Godfrey furnaces, in Huntingdon-Heberlein pots and in Dwight-Lloyd sintering machines. The fumes from both blast furnaces contain a considerable quantity of lead and silver. This is recovered by means of the Cottrell electrostatic precipitation plant, which effectually extracts practically all the solid matter in the smoke.

The lead bullion yielded by the blast furnaces is cast into anodes and transported to the electrolytic refinery, where pure lead is precipitated on the cathode and the gold, silver, and other metals sink to the bottom of the long tanks in which the operation is carried on.

The third and newest section of this great plant is the zinc mill. Here zinc-lead ores are crushed and roasted under conditions of careful temperature control, and then leached with sulphuric acid in a plant which bears a striking resemblance to a modern cyanide plant. The tailing contains the lead, iron, and other insoluble ingredients in the ore. The solution rich in zinc goes to precipitation tanks, where the zinc is thrown out of solution with the aid of the electric current.

## GREENHILL COAL MINE.

Blairmore, Alta., June 3.—The output at the Greenhill mine of the West Canadian Collieries, Ltd., is increasing daily and soon will be one of the largest producing mines of high-grade coal in Southern Alberta.

The mine was put into operation soon after the closing down of the old Blairmore mine and although it is only in its infancy it is already producing about an average of 800 tons per day. A new incline is in course of construction in No. 2 seam and when this is completed it is expected the mine will be producing something like 1,000 tons daily. The new steel tipple which is being constructed to the railway siding is almost completed.

Several hundred men are already employed at the mine. W. G. Pearson is the pit boss.

## MINING ENGINEERS FOR MILITARY SERVICE.

According to news despatches from Ottawa, the War Office asked last month for fifty mining engineers for special service. It is now stated that only a few were required and we are authoritatively advised that the numbers have now been made up.

# THE IRON MINES OF WABANA, NEWFOUNDLAND

By J. W. McGrath.

On a tiny little island, off the coast of Newfoundland, once called Bell Island but now familiarly known as Wabana, are two of the largest iron ore mines in the world. The island measures twelve miles by two, and extends for about two miles out under the ocean. It is situated at the mouth of Conception Bay, on the eastern coast, and is thus wholly exposed to the Atlantic gales that strike in with much frequency along that weather-beaten shore. In a direct line it is 12 miles distant from St. John's, the capital, while the nearest point on the mainland is six miles away. With regard to the ore markets of the world it is conveniently situated, being practically at an equal distance from both American and European ports. To Sydney, Nova Scotia, the distance is 412 miles, to Liverpool 1,996 miles, to Philadelphia 1,240 miles.

During the summer of 1895, when the mines on Bell Island were being opened, Mr. Thos. Cantley gave the locality the Indian name "Wabana," which means "the place where daylight first appears," an appropriate name for this eastern portion of the continent.

The Wabana iron ore deposits are owned and mined by two Canadian firms, the Nova Scotia Steel and Coal Company, and the Dominion Iron and Steel Company, operating steel plants at Sydney Mines and Sydney in Cape Breton. According to the report of the Department of Mines, Newfoundland, these two companies have taken annually over a million tons of ore from their mines at Wabana, and during the year previous to the outbreak of the war the total quantity of ore shipped from these mines was 1,605,920 tons, of which 1,048,432 tons was shipped to Sydney and 557,488 tons to the United States and Europe. The Wabana mines have accordingly been furnishing during the last few years from 47 to 50 per cent. of the total amount of iron smelted in Canada. Of the ore shipped from these mines to Europe during 1913, 200,000 tons went to Krupps, Germany, to make the big guns which have since been used with deadly effect both on ourselves and our allies.

The ore is a non-Bessemer, red, oolitic hematite, with an appearance hard and blocky. Average analyses of the cargoes being shipped from the mines show the bulk of the ore to run from 53 to 55 per cent. iron, one per cent. moisture, 0.9 per cent. phosphorus, and from 7 to 14 per cent. silica. Among the purchasers of the ore Bethlehem Steel Co. and the Krupps have been the largest buyers.

The ore forms part of a series of Ordovician sediments which are here exposed. The ore beds outcrop for about three miles along the northern shore of the island, and then dip in a north-easterly direction. An extraordinary concentration of ferruginous minerals occurs in the five principal zones in the upper 1,000 feet of strata, which comprise with the accompanying sandstone and shale, a fossiliferous series of shallow water deposits.

From the island the ore dips out under the sea from seven to fourteen degrees. Of the six seams only the three uppermost are being worked; these are those which outcrop for about three miles along the northern shore of the island. Certain names have been given to the various ore beds, and among others "Dominion bed" and "Scotia bed" to the principal workable beds.

These names were applied before submarine mining commenced when the Dominion bed was operated by the "Dominion" Company, and the Scotia bed by the "Scotia" Company on the land claims on the island. In the case of the submarine holdings, which are now being worked more than two miles out under the sea, each company owns all the beds within its respective areas, the boundaries of which are vertical. At the present time the Scotia Company is mining largely from the Dominion bed, as well as the Scotia bed, while the Dominion Company owns a part of the Scotia bed as well as part of the Dominion, and other beds in their submarine property. Hence the names of the ore beds do not indicate the names of the owners. In the land areas the lower or "Dominion bed" is about twelve feet thick. The "Scotia bed" is 7 feet thick. At depth the ore beds get thicker and somewhat richer than at the outcrops.

### Earliest Geological Reference.

During the year 1843 the first Geological Survey of Newfoundland was made by J. B. Jukes, and in his report the following descriptions are found: "On the south-east coast of Kelly Island, a mass of gritstone, in many beds having a total thickness of thirty or forty feet, rises into the middle of the cliffs. . . . . in Little Bell Island as well as in Bell Island itself, several bands of similar stone exist. . . . In the upper beds of Bell Island, namely, those of the north-west side, there is but little stone, although one bed of bright red sandstone about 8 feet thick was observed."

This is the earliest reference to Wabana ore, as the only bright red strata of the island are beds of a ferruginous oolite whose color is due to hematite, and a bed of about the thickness noted forms a striking feature of the north-west coast.

In the Geological report for 1868 of Newfoundland the highest stratum on the western end of Bell Island is described as "a mass of greyish granular white weathering sandstones," which underlies the principal ore beds. Higher strata containing the iron ore are exposed farther east, but as these are not included it is probable they were not visited, and one of the most wonderful accumulations of iron ore in the world remained unknown until many years later.

### The Discovery of the Ore.

Previous to the mining days Bell Island was sparsely settled by Irish settlers who lived by farming, and took their product to sell to St. John's in sailing vessels. The story runs that one of the vessels which used a quantity of heavy red stones which lay along the beach at Bell Island, after taking a load of provisions at St. John's, left the stones on one of the wharves there. An Englishman in a vessel at the same pier noticed the rocks, and took a portion across the Atlantic with him to England where he had it analyzed. The prospect was immediately leased to this party, who sold it in 1893 to the Nova Scotia Steel Company for $120,000. This company at once began operations for the development of the deposit, and once the initial difficulties were surmounted large annual yields of a high grade ore were obtained.

### Scotia Co. Sells Part of Its Holdings.

In 1899 a portion of the areas leased to the "Scotia" Company was sold to the then recently formed Dominion Iron and Steel Company. The latter acquired the

lower bed while the Nova Scotia Company reserved for themselves the upper bed, the ore in which contains a higher percentage of iron tha nany of the other seams. This sale included a submarine area of three square miles adjoining the shore. As the work progressed, additional areas were secured by both companies and at the present time the total holdings of the Nova Scotia Company are 83½ miles. To reach the "Scotia" submarine areas it was necessary to pass through the Dominion areas which adjoining the land extend almost 4,000 feet to the deep. In selling the areas an agreement was made between the two companies by which the slopes could be driven through the intervening areas, and the Dominion Co. accordingly commenced work in 1905.

### Amount of Ore in Deposits.

Altogether there are twelve bands of ore which range in thickness from one to ten feet. The largest are so accessible that almost all the ore they contain is minable, for the ore readily separates from the under and overlying strata. In a paper on "The Iron Ores of Newfoundland," J. P. Howley, head of the Geological Survey of Newfoundland, says: "By the aid of the dip and strike of the strata it is possible to form a fair idea of the extent of the trough. . . . and provided the bands retain their thickness and stratified character throughout the result arrived at reaches the enormous total of 3,635,343,360 tons."

In 1913 Mr. Elwin E. Ellis and Mr. Edwin C. Eckel, both eminent geologists, the former being of the United States Geological Survey, each having made an estimate of the amount of Wabana iron ore, gave the results of their findings as testimony in a legal case known as the "Steel Corporation Dissolution Suit." Mr. Ellis "estimated the reserve at 3,250,000,000 tons, allowing for workings five miles long," while claims have since been taken 12 miles from the shore and it is planned to operate workings for that length. Mr. Edwin C. Eckel testified " . . . that in Newfoundland there were 3,500,000,000 tons of economically available ore within a radius of five miles from Bell Island. Besides this there are billions of tons which are not economically available at this time. In one deposit alone . . . . the ore runs thirty feet thick and contains about 90,000,000 tons to the square mile."

### The Nova Scotia Company's Mine.

The ore is first won by exploding small charges of dynamite. The room-and-pillar system for extraction of the ore is used. In the stopes and main drifts pit props are used. The slopes in submarine areas are carried on by back stoping, a portion of the ore being left to stand upon.

"Electric steam" shovels load the broken ore into the stopes. These shovels have loaded 350 tons in a shift.

Centrifugal pumps electrically driven by direct connected motors are used to keep the mine dry. Pumping is done in two lifts, storage dams being placed almost at the bottom of the mine and again at a point 4,200 feet below the surface.

The mine is ventilated by a motor driven fan of 80,000 cubic feet per minute capacity at 8-in water gauge, overlying the shaft.

The shafts are driven double, one shaft being for hoisting and the other for air; they are divided by a rock pillar.

The hoisting of the ore to the surface is done by engines which are of the largest type used anywhere in Canada. The largest of these hoists is first motion, duplex, Corliss valve, built by Fraser and Chalmers of England. It has cylinders 28 inches by 60 inches, equipped with an 11-foot drum, with steam operated post-brakes, Whitmore overwind device, and space for 10,000 feet of 1½-inch cable. There are two drums which lock together for hoisting in balance. The skips are of 4,500 pounds capacity; they operate in balance. The slope track has an average grade of 16 degrees, and is laid with 80-pound rails. A hoist takes 30 seconds.

After the ore has been picked on a rubber belt, 150 feet long, inclined at 17 degrees, it falls into a bin, from which the cars are loaded, and it is thence conveyed to shipping piers about a mile and a quarter distant. Enormous hoppers take the ore to the loading chute which feeds into the steamer's hold. There are two shipping piers, one of steel, the other of timber. With the excellent loading appliances used by the company, steamers carrying 12,500 tons are fully loaded and dispatched in less than four hours.

During the winter, from December till May, no ore is shipped, and the total quantity mined is stock-piled, at the cost of ¾ of a cent per ton by a device which can handle about 1,400 tons a day.

### Cost of Mining the Ore.

The ore is very cheaply mined. Mr. A. J. Moxham, the American iron and steel expert, who built the smelters at Sydney, declared in a lecture at Toronto that "at Bell Island mines the actual price of mining and putting the ore on cars is less than the traditional contractor's price for removal of earth; in fact, the ore is capable of being mined as cheaply as dirt, and in making steel at Sydney, the cost of freight on the assemblage on the raw materials there being fifty-five cents in all; the cost of assemblage is the lowest in the world, and represents a saving of $2.45 a ton over the assemblage cost in Pittsburg, Pennsylvania.

### Where the Ore Goes.

The great portion of the ore mined by the Dominion Company goes to its smelters at Sydney, while the bulk of the ore mined by the Scotia Company is sold in the open market. The pig iron and steel manufactured by the smelters at Sydney is sold all over Canada, a large section of the Grand Trunk railroad to the Pacific coast was built from the steel rails produced at Sydney, while large quantities of the rails have been used to build railways in India.

When the mines first opened a vigorous attempt was made to induce both companies to erect smelters in Newfoundland, but owing to the fact that the Dominion Government offers large bounties to such industries, which Newfoundland not being politically part of Canada, was too poor of herself to afford, it was found more profitable for smelters to be erected in Canada than in Newfoundland, and thus maintaining her foolish attitude of trying to "paddle her own canoe" Newfoundland sacrificed a most remunerative avenue of employment. In default of not erecting smelters in Newfoundland the Government has taxed the ore mined by both companies; this tax yields to the Department of Mines about $120,000 annually.

About 2,000 men are employed at the mines all the year round. The floating population is small. A large part of the employees are married men who have their own houses on the Island. The harmony existing between the companies and the men is expressed by the

fact that since the mines opened there has never been a strike, and last year both companies, without any expression on behalf of the employees, granted a substantial increase to the daily wage paid to all the miners.

The Island is systematically laid out, and the houses are lighted with electricity. The municipal government of the Island is now about to install a sanitary system that should make Wabana one of the healthiest towns in Newfoundland.

## ADDITIONS TO HOLLINGER PLANT IN 1915

Hollinger's expenditure for plant and equipment in 1915 amounted to $314,705.87, distributed as follows:

**Buildings.**

| | | |
|---|---|---|
| Dwellings | $6,835.65 | |
| Cyanide plant | 32,393.52 | |
| Stamp mill | 7,608.19 | |
| Transformer station | 4,524.05 | |
| Hoist house | 840.66 | |
| Railway platform | 785.04 | |
| Garage | 466.25 | |
| Change house | 354.24 | |
| Miscellaneous | 58.35 | |
| | | $53,865.95 |
| Fencing and guard houses | | $10,645.85 |

**Equipment.**

| | | |
|---|---|---|
| Stamp mill | $109,802.97 | |
| Cyanide plant | 63,525.34 | |
| Mine equipment | 28,587.53 | |
| New hoist | 15,348.39 | |
| Surface electric railway | 12,108.66 | |
| Sprinkler system | 9,292.79 | |
| Railway siding | 4,658.10 | |
| General plant | 4,238.57 | |
| Machine shop | 3,102.05 | |
| Transmission lines | 1,612.02 | |
| Lighting system | 538.21 | |
| Office furniture | 580.40 | |
| Pumping plant | 450.91 | |
| Water lines | 241.39 | |
| Assay office | 203.88 | |
| Air lines | 152.99 | |
| Refinery | 115.47 | |
| Camp equipment | 450.00 | |
| Miscellaneous | 69.08 | |
| | | 255,078.75 |
| | | $319,590.55 |
| Less sales of scrap and live stock | | 4,884.68 |
| Charged to plant | | $314,705.87 |

In his report for the year 1915, President N. A. Timmins says of plant additions:

"Expenditures for plant amounting to $314,705.87 were again a heavy item, but there can be no doubt as to the wisdom of this policy of extending plant, when the rapidly increasing ore reserves are considered. As explained in the report of last year, the mill was then being increased to a capacity of 1,600 tons per day. This increased capacity was secured, but it soon became evident, in the light of underground developments that the tonnage could, with advantage, be increased still further, and we are now in the midst of alterations and additions which will raise the capacity of the mill to 1,900 tons per day. Contemporaneously with the increase in milling capacity, it has been necessary to increase the plant in other departments of our works. The handling of increased tonnages underground has necessitated the installation of a system of electric locomotives in the mine, an investment which paid for itself in the first six months of operation, owing to the saving made in the cost of tramming. The hoisting of the ore from the mine to the surface required the installation of hoists of much greater capacity, and the increased consumption of electric power has demanded the building of a new transformer station. It has been found necessary to add greatly to our workshop equipment, and underground equipment of drills, cars, etc. The handling of supplies, coal, timber and general work upon the surface has justified the installation of an electric trolley system which serves the different parts of the property. A spur has been built on to the property from the line of the T. & N. O. Railway, by means of which all supplies are landed in the midst of our works. All of these additions have been necessary to keep pace with the rapid growth of our mining and milling operations, and the money required has come from profits, without interfering with dividends or cash reserves. A complete justification of the expense is found in the great reduction made in the matter of working costs."

## BEAVER CONSOLIDATED.

In a letter to the shareholders of Beaver Consolidated, President F. L. Culver says:

"The main shaft is down 1,630 ft. The lower contact between the Diabase and Keewatin formations was encountered at a depth of about 1,570 ft. We are cutting the station at the 1,600-ft. level, from which point lateral development will be commenced. Our intention is to drive a crosscut both east and west of the shaft, which, by reason of the dip of the Diabase intrusion, we anticipate will enable us to explore the ground both above and below the contact. Work on the upper levels of the property, a large portion of which is still unexplored, is progressing favorably, and on the 530-ft. level we recently encountered a shoot of high-grade ore about four inches in width, which has been proven for a distance of twenty feet. Three cars of concentrates and one of high-grade have been shipped this quarter.

Experiments with oil flotation for the purpose of making a recovery of silver from mill tailings which in the past had been thought practically valueless, are proving so successful that several companies in the camp are installing flotation plants, and it may be advisable for this company to make a similar installation.

May 31, 1916: Bullion in storage, 186,433.19 oz.; ore at smelters, 39,350.03 oz.; ore bagged at mine, 68,700.00 oz.; total, 294,483.22 oz.; cash on hand, $92,483.68.

On April 29, 1916, we paid a dividend of 3 per cent., distributing $60,000 among the shareholders.

Results to date of exploration at the Kirkland Lake property being operated by us are very encouraging. The shaft has reached a depth of 200 ft. and stations have been cut at the 100-ft. and 200-ft. levels. On the first level, we are continuously in ore for a distance of 115 ft., channel assays running as high as $112 to the ton, while assays from vein samples show values of nearly $400 to the ton. We are driving a crosscut on the 200-ft. level to prove the vein at this depth. Development shows 115 ft. of sinking, 278 ft. of crosscutting and 206 ft. of drifting.

# FLOTATION OILS

By O. C. Ralston.*

### Market Situation.

The sudden development of the art of flotation has brought about peculiar conditions in the oil market. A few years ago there was considerable expansion in the wood-distilling industry throughout the south on the hope of selling turpentine at not less than 50 cents per gallon. This hope was never realized and the industry became demoralized owing to excessive production and the efforts of some plants to keep going even at a loss. Pine oil, which previously has had little sale, is a by-product from this industry and has been found one of the best of oils for flotation purposes. At the time of the introduction of the flotation process into America a stock of pine oil that had accumulated was for sale at an attractive figure.

This supply of pine oil and its derivatives has been largely exhausted and we are having to depend upon current production for the present supply. Hence the price has soared, and some of the pine oil on the market has been adulterated. Pine oil is also proving to be a valuable antiseptic and it is doubtful whether it will ever again be sold cheaply. Furthermore, turpentine is now about 50 cents per gallon and the fractionation of the wood distillate is being made in favor of a high yield of turpentine.

During 1915 an investigation in connection with the flotation oils was conducted for the purpose of finding a substitute for pine oil. Most of the wood creosotes have proved acceptable and are now being sold at lower prices than the pine oils. How long this condition will continue is a matter of conjecture. The creosotes have proved to be good preservatives of wood, especially of railroad ties. However, coal creosotes excell wood creosotes for preserving timber, so that flotation will probably cause most of the wood creosote to be diverted from timber preservation. Further, the starting of many large flotation mills during the coming year, and the enlargement of many that have been operating in an experimental way, may create such a demand for wood creosote that the cost of this oil may equal that of pine oil.

In view of such a possibility, considerable work has been done to determine whether coal tar and coal tar creosote could not be successfully used as flotation oils. In many instances it was possible to do so only after adding a small amount of one of the true wood oils. There is some difficulty in getting the thick heavy coal tar to mix well with the pulp, so that it is not the most desirable medium, and for that reason the coal creosotes have met with more favor. Consequently, most of the gas plants throughout the United States have been able to contract for their output of creosote for some time to come. A similar condition prevails with regard to most of the wood oils. There has been somewhat of a rush in the mining industry for contracts for these products in order that proposed mills will be assured of being able to operate.

The petroleum men have not been slow to seek the flotation oil market, but their products have not as yet met with much success when used alone. It is possible to mix small amounts of pine oil or creosote with various petroleum products such as stove oil and to obtain flotation with some degree of success, but the general tendency of petroleum products is to float both gangue and mineral non-selectively. The petroleum products that have met with the most success are some of the crude oils, such as Texas crude, and especially certain high-sulphur crude petroleums, obtainable in Kansas and in California. "Stove oil" has met with some success in the copper concentrating mills, as copper minerals do not have to be concentrated to the same degree of purity as do the lead and zinc minerals. It is probable that, for the wood oils, the copper mills will be able to use cheaper substitutes, such as petroleum products, than will the mills treating baser metals.

One other product that has met success has been the "kerosene acid sludge" from certain of the petroleum refineries. This material is the resultant of the removal of certain impurities with sulphuric acid and often consists of as much as 50 per cent. sulphuric acid. Not all of the acid sludge products have proven suitable, only the California sludge being sold at present.

Just how far all this substitution will be successful is not known and there is no way to predict. The test work of the coming year should go far towards solving this problem.

### Costs of Flotation Oils.

The costs of flotation oils have varied so much, owing to the unsettled market that it is almost impossible to give an idea of what they should cost. For a rough estimate it is possible to say that crude petroleum will cost the same as for other purposes. Many of the specialized products, such as coal tar, will cost about 5 cents or less per gallon. The coal creosotes and the wood creosotes cost 15 to 30 cents per gallon; the pine oils 45 to 60 cents per gallon, and eucalyptus oil will cost $1.50 or more per gallon. The effect of the ending of the war as regards coal tar and creosote in the American market is uncertain but, so far as known, wood products will not be affected, and petroleum products for flotation will almost certainly be little affected. Flotation men do not like to have their oil costs go over 5 cents per ton of slimes treated, and many costs are nearer to 2 cents, or possibly even less.

### Oils Adapted to Certain Ores.

There can be no doubt that the higher grade pine oils and other wood oils are the best adapted to general flotation work, but the question of what is commercially feasible is entirely different. Thus, the wood creosotes are meeting much favor. Many of the special petroleum products, especially those high in sulphur, are adaptable for rough concentration of copper ores, but the most favored materials for such ores at present seem to be the coal-tar products in combination with topped crude petroleum, oils from which the lighter fractions have been removed by distillation. Coal tars and creosotes, with a small addition of pine oils, are being used a great deal in zinc work, and the wood creosotes find favor in the treatment of galena ores. Gold and silver ores seem to require much pine oil, although the pine oil can be diluted with some of the coal creosote oils.

It will be found that there is a considerable number of oils that will give good results on any given ore, if the mechanical treatment is adjusted to suit each given oil. The selection of the proper oil in any case is purely a matter of experiment. Local conditions, such as transportation, also influence considerably the choice of oils.

*U.S. Bureau of Mines.

## GOODFISH LAKE.

A geological map of the Goodfish Lake area has just been published by the Ontario Bureau of Mines. It accompanies the Boston Creek map, prepared by Mr. Burrows.

La Belle Kirkland mine is in the area shown, being located on the south shore of Goodfish lake.

## THE ANNEALING OF NICKEL-SILVER.

In a paper presented at the annual general meeting of the Institute of Metals, held in London on March 29th, 1916, Mr. F. C. Thompson gave an account of a study on the annealing of nickel-silver.

The results of Mr. Thompson's exhaustive experiments, which run to 31 pages of printed matter and diagrams, can be briefly summarized as follows:

1. Tensile tests on the alloys containing from 7 to 28 per cent. of nickel in the cast state, show a distinct increase of strength as the nickel content is increased, without, however, appreciable change in the elongation or reduction of area. The results of compression tests are remarkably constant throughout the whole series of alloys tested, changes of the nickel content exerting in the cast state very little effect indeed.

2. Deoxidation of the molten alloy with 0.25 per cent. of manganese results in a marked improvement of the behaviour of the material in the rolls.

3. As the nickel content of the alloy increases the specific volume is lessened, which is also the result of increasing the ratio of the copper to the zinc. The density is slightly greater in the work-hardened state than after annealing, and also in those alloys which have been deoxidized.

4. The electrical resistivities of the alloys after being reheated at increasing temperatures reveal a well-marked transition between 300 and 400 degrees C., which is shown also by thermo-electric curves, but not by inverse-rate heating or cooling curves. The specific resistance of the alloy is determined chiefly by the nickel present: = 12 + nickel per cent. microhms per cubic centimetre. With the exception of the alloys containing only 7 per cent. of nickel the resistance is practically the same in the hard-drawn and in the annealed states.

5. Torsion and hardness tests show well the temperature at which annealing starts, which increases, as the nickel content is raised, from 370 degrees C. with 7 per cent. to 600 degrees C. at 28.6 per cent. The hardness results show a sharply localized peak about 320 degrees C. The influence of time on the temperature at which annealing commences is negligible, though the temperature of the critical point is slightly lowered with "soaking."

6. Tests made on commercial samples of the Brinell hardness and the resistance to alternating stress (Arnold) indicate that the impurities usually present are practically without effect on the properties, at the temperature of annealing.

7. The results indicate that the tendency of such alloys to "burn" is increased (a) by increasing the nickel content, (b) as the ratio of the zinc to the copper is increased, and (c) with the amount of the impurities present.

For the purposes of the main branch of the work twelve alloys were prepared. The scheme adopted was: firstly, to determine the influence of the nickel contents in such alloys by preparing four casts, each containing 60 per cent. of copper, but with 7, 15, 20 and 28 per cent. of nickel respectively; secondly, to obtain some idea of the influence of the ratio of the copper to zinc, when the nickel content is unaltered, to which end a cast was made with 15 per cent. of nickel but with 55 per cent. only of copper; thirdly, to investigate the influence of the addition of 0.25 per cent. of manganese added as a deoxidant, as a result of which each of the five casts already referred to were duplicated and deoxidized; and fourthly, to add an excess of manganese —1.5 per cent.—to the alloys with 15 per cent. nickel and 55 per cent. copper, and that with 28 per cent. nickel and 60 per cent. of copper respectively, and to observe the influence on the physical and mechanical properties.

The number of variables already introduced is large, whence every effort was made to keep these alloys pure, and to eliminate the further effects of the impurities usually present in commercial samples. The materials used were electrolytic copper and zinc, and Mond nickel, all of the highest commercial degree of purity. From these a cupro-nickel and a cupro-zinc with 50 per cent. of each element were first prepared as basis alloys, from which the required compositions were obtained by the addition of fresh metal. No scrap was used in any of the casts. In the case of the deoxidized alloys "thermit" manganese was used to deoxidize first the basis cupro-nickel, and finally the remainder of the quantity to be added was put in the melted alloy a short time before casting. The melting was carried out in quantities of about 1 kilogram, in graphite crucibles heated in a coke crucible furnace.

The compositions of the alloys are recorded below:

**Compositions of Nickel-silvers Tested.**

| Cu. | Ni. | Zn. | Manganese added. |
|---|---|---|---|
| 60.6 | 7.62 | 31.7 | .... |
| 60.2 | 7.80 | 31.8 | 0.25 |
| 61.8 | 16.4 | 21.7 | .... |
| 61.2 | 15.5 | 23.2 | 0.25 |
| 61.6 | 22.4 | 15.85 | .... |
| 61.6 | 19.8 | 18.45 | 0.25 |
| 55.7 | 17.4 | 26.7 | .... |
| 54.3 | 15.75 | 29.7 | 0.25 |
| 56.2 | 16.3 | 27.6 | 1.5 |
| 61.2 | 28.6 | 9.81 | .... |
| 60.4 | 27.9 | 11.42 | 0.25 |
| 60.9 | 26.7 | 13.15 | 1.5 |

## WEST SHINING TREE.

According to Mr. A. M. Bilsky, who is in charge of the development of a gold property in the West Shining Tree area for a Montreal syndicate, good results are being obtained from systematic prospecting in MacMurchy Township. Mr. Bilsky's company, the Atlas, is employing at present about 40 men.

On the adjoining property, the Knox claims, a shaft is being sunk and rich ore has been taken out. The Knox property is being developed by a Buffalo syndicate.

West Shining Tree area, including the townships of Asquith, Churchill, MacMurchy, and Fawcett, is situated in the Sudbury Mining Division. MacMurchy is about 70 miles north of Sudbury, and 60 miles south of Porcupine. From a station 80 miles north-west of Sudbury, on the Canadian Northern, West Shining Tree is reached by a circuitous canoe route. A few years ago a wagon road was cut out and partially graded, and it is hoped that the completion of this wagon road will soon be undertaken.

Many good discoveries were made in the West Shining Tree district a few years ago, but comparatively little work has been done on them. Those who took options did not find enough encouragement to warwant the fancy prices asked by the owners of the claims. Consequently, after being the scene of a little activity on the part of those who took options, West Shining Tree ceased to attract capitalists. Now that more reasonable terms are available and some development work is being done, the area will probably receive more attention.

## RAMBLER-CARIBOO MINES, LTD.

The Northwestern Mining News Service, of Spokane, Washington, in which city is the headquarters of the Rambler-Cariboo Mines, Ltd., one of the oldest mining companies now operating in the Slocan district of British Columbia, recently sent out particulars of the company's operations and results, as under:

The net earnings of the Rambler-Cariboo Mines, Ltd., with mines and a concentrating mill about four miles from Three Forks, B.C., were $123,500 for the fiscal year ended April 30, 1916, according to a preliminary report sent to stockholders by the directors. The annual meeting will be held June 13 at Three Forks, and these figures will be incorporated in the yearly statement of operations.

The directors announce that they have decided to distribute dividends for the current fiscal year every 60 days, instead of monthly, as heretofore, to curtail expense as much as possible and to obviate the work of sending out so many cheques, as the stockholders are scattered over a wide area. They state also that the property is in excellent physical condition, and that there is enough ore in sight to keep the mill operating at capacity for the next two years. Since May 1, 1915, development aggregating 1,360 ft., confined principally to the 700, 800, 900, 1,000, and 1,200-ft. levels, opened new orebodies on each of the levels except the 1,300, which will have to be driven farther north to get under the shoot exposed in the next upper workings.

During the greater part of the year under review the concentrator was operated 20 hours daily, but it soon will be in operation three eight-hour shifts. There was 21,000 tons of ore milled during the period, producing 1,800 tons of concentrates that contained 1,292,644 lb. of lead, and 142,066 oz. of silver, and 630 tons of concentrates that returned 472,871 lb. of zinc and 14,689 oz. of silver. This does not include 500 tons of zinc concentrates shipped in April, from which smeltery returns have not yet been received, nor 500 tons of zinc concentrates still stored at the mill.

The financial statement is as follows:—

**Receipts.**

| | |
|---|---|
| Balance from previous year | $ 5,325 |
| Ore in transit last year | 33,801 |
| Lead ore and concentrates | 89,568 |
| Zinc concentrates | 18,189 |
| Transfer fees | 141 |
| Sale of compressor | 748 |
| Sale of wagons | 200 |
| Total | $155,964 |

**Disbursements.**

| | |
|---|---|
| Bills payable | $ 10,000 |
| Dividends | 52,500 |
| Production and development | 76,906 |
| Equipment, machinery and stores | 1,108 |
| Total | $140,514 |
| Less special discounts and profits on boarding house | 1,059 |
| Actual disursements | $139,455 |
| Cash on hand | 16,509 |
| Total | $155,964 |

Beside having cash on hand, as shown in the foregoing statement of accounts, the company is reported to have ore and concentrates to the estimated value of $44,491, either in transit to smelteries or stored at the mill near Three Forks.

Since the preliminary statement, as above, was made public it has been announced that the directors have decided to pay a dividend of two cents a share on June 15, which payment will total $35,000. Earlier in the current calendar year there was a profit distribution of one cent a share, or $17,500.

About twelve years ago the company, on the recommendation of its then general manager, Mr. W. E. Zwicky, of Kaslo, undertook deep-level development of its mine, and commenced to drive a long adit at a depth of 650 ft. below its No. 8 level, which was at that time reached by shaft from the No. 3 level. After the adit had been driven nearly 4,500 ft. connection was made by a raise with the old workings above and the opening of what was practically a new mine, ore shoots having been discovered on the opposite side of the shaft to that previously worked, was steadily proceeded with. This was the first important deep-level mining done in Slocan district, and although it involved a financial drain that continued over about half a dozen years, it eventually was found to have been fully justified. Finally the old concentrating mill that had been erected on the mountain on a level with No. 3 adit was removed to the valley below, improved equipment was added, an aerial tramway built from the portal of the new adit down to the mill, and railway connection was established as well.

## TYEE COPPER CO.'S SMELTERY AT LADYSMITH, B. C.

Among other recently suggested methods of "Aiding the Mining Industry" was that of a correspondent of a Victoria, B.C., newspaper who desired that steps be taken to secure a resumption of operations at the Tyee Copper Co.'s smelting works at Ladysmith, Vancouver Island. In this connection there has since been published the following statement by Mr. W. J. Watson, resident manager for the company: "For several years prior to the closing of the Tyee Copper Co.'s smeltery at Ladysmith, it was operated entirely on custom ores, the treatment rate of which was reduced by the company to the lowest possible figure, in order to encourage the small mine-owner to work his mine. The company was, though, in the latter part of 1911, finally forced to close the works on account of a shortage of ore. That shortage was not due entirely to a decreased output from Coast mines, but to the fact that the company operating the Tacoma smeltery was in a position to quote a slightly lower smelting rate than the Tyee Company. The Tyee Company has, however, kept its smelting plant in first-class condition, and will be prepared to resume smelting operations immediately it shall be guaranteed the supply of a sufficient quantity of ore to pay the running expenses of the plant, which quantity would be approximately 5,000 tons a month. That amount would keep only the company's smallest furnace in operation about 22 days a month."

Since the publication of Mr. Watson's letter, Commissioner Cuthbert of the Victoria and Vancouver Island Development Association, has brought the matter to the attention of a special committee on the iron and steel industry with the object of inducing those already working, and those about to work, mining properties, to ship ore to the Tyee Co.'s smelting works. Mr. Cuthbert states that during recent weeks many complaints have been made to him by owners of small mining properties who are unable under existing conditions to get any ore treated, for the reason that the Tacoma smeltery, which is the only one now being operated in the lower Coast district, will not accept

ore unless a minimum guarantee extending over three years is given. This condition makes it impossible for small mines along the British Columbia coast to be worked. An effort is being made to induce owners of small mining properties to co-operate in an endeavor to secure a certain minimum supply of ore so that the Tyee Copper Co. may be justified in resuming smelting at its works at Ladysmith.

## LUCKY JIM ZINC MINES, LTD.

The following information is of more than ordinary interest to a number of shareholders in the company it relates to, for last year it was not thought practicable to prevent foreclosure by the mortgagee and the consequent total loss of all interest in the property by the shareholders, who have to thank the British Columbia Supreme Court judge mentioned below for his reluctance to order foreclosure when application was made to him to do so, and for having sanctioned arrangements for a final effort to redeem the mine.

The financial difficulties of the Lucky Jim Mines, Ltd., which owns and is operating the Lucky Jim mine at Zincton, B.C., seem in a fair way of adjustment, according to the first annual report of Mr. Andrew G. Larson, of Spokane, who several months ago was appointed trustee for the corporation by Mr. Justice Gregory of the Supreme Court of British Columbia.

Mr. Larson stated that, despite serious difficulties in carrying on productive operations at the mine, especially during the winter, due to lack of mill and railway transportation facilities much of the time, he had paid into court $15,000 on account of the mortgage on the property, and expected to be able to make a further payment of $5,000 before the end of May. If the mill at Rosebery, which is concentrating the Lucky Jim ore, were equipped with machinery for the treatment of middlings these sums, he says, could have been increased by $10,000.

An important matter he had been able to adjust, thereby effecting a saving to the company of practically $30,000, was the claim of the Canadian Pacific Railway Co. to the right to charge $2 a ton on Lucky Jim ore until $35,000 in all had been paid as refund on the cost of a spur used by the company as a part of its line from Three Forks to Kaslo. Better smelting contracts were also obtained by him, which on the April shipments alone increased earnings $900. In the settlement of the difficulty with the railway company a refund of $2,940 was secured.

As regards the future he said that weather conditions now being settled he expected better returns throughout the summer. In the event of the mill at Rosebery being provided with additional concentrating facilities, allowing of the re-treatment of the 1,000 tons of middlings now on hand and permitting a closer saving in the future, the net earnings should run between $10,000 and $15,000 a month. Failing to get adequate mill facilities at Rosebery he expected to obtain them soon either at Kaslo or the new Ivanhoe mill.

April shipments were as follows: Crude ore direct to smeltery, 40 tons; concentrating ore to mill, 1,290 tons; concentrates from mill to smeltery, 325 tons. The crude shipping ore averaged 42.2 per cent. zinc, and the estimated profit on the carload is $1,172. The concentrates ranged by carloads from 37.8 to 41.6 per cent. zinc, the estimated net value being about $26 a ton and the total net value, $8,519.

## WOLVERINE MINING AND DEVELOPMENT CO., B. C.

From Spokane, in which city are situated the head offices of quite a number of mining companies operating in the West Kootenay district of British Columbia, there was recently sent out the following statement:

"The Wolverine Mining and Development Co., with holdings near Ainsworth, B.C., will shortly ship its first car of ore, and Mr. J. Cleveland Haas, managing director, has gone to the property to outline extensive development.

"Said Mr. Haas: 'We have been doing a little development for several months, but it was only recently that weather conditions permitted our getting things into shape for more active work. The ore we have ready for shipment averages about 60 per cent. lead and 20 oz. of silver to the ton, and the indications are that there is a considerable quantity of ore of that grade available for extraction. The company is controlled by Eastern people, with Mr. Jerry Madden, of Rapid River, Michigan, as president. Mr. J. F. Carey and myself are the only Spokane directors. Mr. Carey went East lately to arrange for financing the extensive development and equipment with machinery we have planned to carry out during the ensuing summer. The company's property consists of a group of mineral claims situated a little north of the town of Ainsworth, extending from the shore of Kootenay Lake west to the Consolidated Mining and Smelting Co.'s Highland silver-lead mine, and adjoining the Florence Mining Company's group on the south. The main working tunnel will be driven from low down near the lake shore.' "

When the Journal's British Columbia correspondent visited the Wolverine Co.'s group last October, exploratory work was in progress and log buildings for the accommodation of the men working on the property were well advanced toward completion. At that time the unincorporated organization operating on the claims then known as the Nicollet group was called the Kootenay Development Co., and the foreman in charge was Mr. W. A. Harvey. Much ore had at that time been opened on the adjoining Hope group of the Florence Mining Co., and the outlook for the several mines in that part of Ainsworth mining division was generally regarded in the neighborhood as very promising.

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The nineteenth annual session of the American Mining Congress will be held at the La Salle Hotel, Chicago, Illinois, during the week of November 13, 1916. The purpose of the convention will be to inaugurate plans by which all branches of the mining industry may work together in the solution of common problems. A general meeting will be held each morning, and the convention will then divide itself into Precious Metals, Iron and Steel, Oil and Gas, Lead and Zinc, and Coal sections, each discussing subjects of special interest to its branch of the industry. The convention will occupy two whole floors of the La Salle Hotel, and such space as shall not be utilized for meeting places will be available for exhibits or reception rooms by those directly interested in the convention. A programme of varied interest is being arranged and it is expected that this convention will be the largest in the history of the American Mining Congress.

### A NITROGEN PLANT FOR QUEBEC.

Boston, June 23.—du Pont Powder Co. has completed arrangements for a $10,000,000 subsidiary company which will operate exclusively in Canada. Company has secured water power and other properties on the Saguenay river in Quebec and will soon commence the erection of a plant. Product will be nitrogen, which in due time will be applied to manufacture of high explosives at company's plant in United States.

### U. S. SILVER PRODUCTION.

The final figures for the production of silver in the United States show that four states produced over two thirds of the total output of 74,961,075 oz. The four leaders are Nevada, 14,453,085; Montana, 14,423,173 Utah, 13,073,471, and Idaho, 13,042,461 oz.




**Goodfish Lake area, from colored map just published by Ontarto Bureau of Mines.**

The Tough-Oakes Gold Mine has declared a dividend of ten per cent., payable July the 15th. The Tough-Oakes is making regular shipments of from eighty to one hundred thousand dollars a month, and the 400-ft. level of the mine is in remarkable ore.

# BRITANNIA MINING AND SMELTING COMPANY, LIMITED

At the annual meeting of the Howe Sound Co., held in New York City last month, the president of that company submitted a brief report and balance sheet; also the report of the Britannia Mining and Smelting Co., Ltd., operating at Howe Sound, British Columbia, and which is controlled by the Howe Sound Co.

### Howe Sound Co.

In his report, President G. B. Schley said: "The dissolution of the Britannia Copper Syndicate and the Britannia Land Co., Ltd., was effected early in the year, so that now all operations are conducted by the Britannia Mining and Smelting Co., Ltd.

"The suspension of production during three months, due to the snow and land-slide of March 21st, 1915, reduced the Britannia Co.'s earnings and made it necessary to negotiate temporary loans with which to meet that company's commitments for material and equipment and carry to completion the extensive plan of new construction adopted early in the year."

(Here followed an account of the Howe Sound Co.'s purchase of the greater number of the shares of the El Potosi Mining Co., of Mexico, and of that company's property and prospects.)

"It is clear to your directors that their policy of the last two years in applying the net earnings of the Britannia Co. to the upbuilding of its property should be continued, and that ample appropriations be made for the conservation of all water power, general construction, and perfection of railroad facilities, thus bringing about the best results in efficiency and economy. It is also essential that the company establish a reasonable cash reserve for its protection. With the present price of copper prevailing and the conditions at the mine developing as now promised, the outlook is hopeful.

"Your directors commend Geenral Manager Moodie and the efficient organization established at Britannia for their intelligent, forceful and untiring efforts during periods of serious troubles, and regard the results as satisfactory.

"Balance Sheet, December 31st, 1915:

"Assets—

| | |
|---|---|
| Share investments | $1,402,800.10 |
| Accounts receivable | 1,186,966.13 |
| Cash on hand | 10,117.70 |
| | $2,599,883.93 |

"Liabilities—

| | |
|---|---|
| Capital stock | $1,984,150.00 |
| Bills payable | 500,000.00 |
| Profit and loss | 115,733.93 |
| | $2,599,883.93" |

### Britannia Mining and Smelting Co., Ltd. ..

Nearly all the information contained in the printed report of Mr. J. W. D. Moodie for the year ended December 31st, 1915, follows:

The year opened with prospects that the Britannia Co. would make its best showing in 1915, but the snow and land-slide in March, which wiped out the Mine Camp, upper terminal of the aerial tramway, crusher-building, machinery, etc., necessitated the suspension of production operations for three months until new producing and transportation facilities from the mine could be provided. Operations were resumed in the latter part of June, but were interrupted in September, October, November and December because of a shortage of water for power and milling purposes, due to an unusually protracted period of dry weather. This condition arose before the system of dams and intakes under construction had progressed so far toward completion as to be available for water storage, thus seriously curtailing the power service.

Statement of Operations.—In the following statement of gross value of metals contained in mill products shipped (30,123 tons), copper is calculated at 17.4468c a pound; silver at 50.08c an ounce, and gold at $20 an ounce.

| | | |
|---|---|---|
| Copper, 9,058,045 lb. | | $1,580,336.64 |
| Silver, 50,306 oz. | | 25,195.56 |
| Gold, 397,862 oz. | | 7,957.24 |
| Payment for iron excess | | 2,644.11 |
| Gross value of products | | $1,616,133.55 |
| Less smelter charges | | 355,380.72 |
| Net returns from smelter | | $1,260,752.83 |
| Less mine operating costs— | | |
| Mining and crushing | $275,854.04 | |
| Transportation | 33,477.57 | |
| Milling | 139,440.32 | |
| Administration, etc. | 60,563.65 | |
| | | 509,345.58 |
| Profit on operation of mine | | $751,407.25 |
| Auxiliary profit | | 58,517.26 |
| Total operating profit | | $809,924.51 |
| Other charges against operations— | | |
| Depreciation, plant and buildings | $284,573.61 | |
| Snowslide losses and expenses (including plant and buildings lost) | 210,347.52 | |
| Interest | 69,431.02 | |
| Reserve for contingencies | 36,158.50 | |
| Miscellaneous | 15,175.69 | |
| | | 615,686.34 |
| Net profit for 1915 | | $194,238.17 |

Property.—Throughout the year the company continued its policy of acquiring by purchase and location such adjoining properties as were considered desirable for the future welfare of the whole operation in protecting the possible extension of known orebodies, as well as to conserve the many watersheds needful and to secure rights of way for pipe-lines, tunnels, etc. Such property purchases entailed an expenditure in 1915 of a little in excess of $100,000. Apart from mine development, the sum of $44,633.61 was expended for prospecting, exploration, surveying, etc., and the labor necessary for assessment work on un-Crown-granted claims. The company's property holdings, as at December 31st, 1915, were:

| | Acres. |
|---|---|
| 164 Crown granted mineral claims, 16 Beach lots | 7,538.16 |
| 167 un-Crown granted mineral claims | 7,500.00 |
| | 15,038.16 |
| 8 timber license areas | 4,366.06 |

Mine.—Because the expenditures for construction and transportation were necessarily large, only a small amount of development and prospecting work was done in the mine during the year, as follows: Drifting, 1,353 feet; raising, 653 feet; crosscutting, 589 feet; total, 2,595 feet.

The total amount of ore handled from the mine to Britannia Beach by aerial tramway was 199,906 tons, at an average transportation cost of $0.1674 a ton.

The average mining cost per ton of ore inclusive of development (including all charges except tramming 97,045 tons of broken ore added to stopes during the year) and crushing charges was $1.7712. The total of ore broken in 1915 was 291,332 tons, of which there was drawn from the mine 194,287 tons, leaving 97,045 tons added to ore already broken in stopes, bringing the total quantity of broken ore remaining in stopes at the end of the year up to 578,206 tons which should average 3.5 per cent. copper.

Attention is invited to the following statement of Fairview mine ore tonnages:

| | Tons. |
|---|---|
| Broken ore in stopes, Dec. 31st, 1915 | 578,206 |
| Ore developed in place | 2,855,947 |
| Probable ore | 2,544,000 |
| Possible ore | 4,275,250 |
| Grand total | 10,253,403 |

The general average of the whole of this ore should be 2 per cent. copper. No allowance has been made for ore occurrences below the 1,200-foot level, notwithstanding that the continuance of some of the veins is shown on the 1,600 and 2,200 ft. levels, with only small development.

No work, neither operation nor development, was done in 1915 in the Bluff, Jane and Empress mines, in which as reported recently by engineers and from knowledge of previous operation, there is ore, as follows: Positive ore, 1,482,800 tons; broken ore in reserve, 1,386 tons; probable ore, 4,661,200 tons; possible ore, 799,000 tons; total, 6,944,386 tons, with an average content of 1.53 per cent. copper.

Mill.—The total quantity of ore milled in 1915 was 212,158 tons. The resulting product, as shipped to smelter, was 30,123 tons, containing gold 397.87 oz., silver 50,306 oz., and copper 9,058,045 lb. Assay and analysis figures of this shipped product are: Gold 0.0132 oz. and silver 1.67 oz. to the ton, copper 15.04 per cent., iron 24.73 per cent., insoluble 26.11 per cent., zinc 3.10 per cent.

Construction.—(1) Utopia dam, at the head of Britannia creek, with a total length of 225 feet, was completed to a height of 50 feet, and a wing-dam 340 feet long, with an average height of 18 feet was constructed on the north side.

On the Park Lane claim, a concrete dam, approximately 240 feet in length, was constructed to a height of 25 feet. It is the intention during the year 1916 to continue this dam to a length of 485 feet and a height of 40 feet.

On Britannia creek, at an elevation of 1,950 feet, the construction of a concrete dam was commenced in September; this attained a height of 10 feet by 120 feet long before work was suspended. Construction will be resumed early in 1916 dimensions when completed will be, length 210 feet, height 30 feet.

To furnish adequate domestic water supply, as well as reserve power for generating energy at the Britannia Beach power-house, a concrete dam, total length 85 feet and height 50 feet, was constructed on Mineral creek.

(2) Pipe lines, consisting of 3,225 feet of wood-stave pipe in sizes 24, 22 and 20 inches, and 7,900 feet of steel pipe in sizes 20, 18 and 16 inches, were laid from the Park Lane dam to the tunnel power house, and from the dam at the 1,950-foot elevation to the Beach a line, 14,610 feet long, consisting of 7,700 feet of wood stave pipe in sizes 36, 30 and 28 inches, and a steel pipe in sizes 28 and 26 inches for a distance of 3,710 feet, connecting with two lines of steel pipe, each 3,200 feet long, in sizes 20 and 18 inches.

A 2,000-k.w. steam turbine was installed in the Beach steam plant with two Babcock & Wilcox boilers, making a total of 2,500-k.w. steam power available for use during periods of low water and consequent power shortage.

(3) The construction of a railroad line for ore haulage from the tunnel to head of incline, a distance of three miles, as well as the inclined railway forming the connecting link between the upper and lower railroads and mill bins was completed during the year. The length of the incline is 5,400 feet, and the average gradient 30 per cent.; it is standard gauge, double track and is laid with 56-lb. rails. Storage bins were erected at the head and foot (above the new mill) of the incline with a capacity of 1,000 and 2,000 tons respectively. As a means of providing further storage facilities, a concrete retaining wall was constructed on the hillside at back of the new mill and will permit of placing in reserve approximately 10,000 tons of ore.

On account of the demolition by snowslide of the upper section tramway terminal at the mine, and to harmonize with the new transportation system, whereby delivery of the ore is made from the raise on the 2,200 foot level (instead of from the 1,050 ft. level, as before), a new tramway terminal was constructed at a point 4,000 feet west of the tunnel portal. This structure is substantially built on concrete foundations with timber superstructure forming bins of 1,000 tons capacity, into which bins the ore is dumped from railway cars and directly fed by gravity to the aerial tramway. Adjoining the tramway machinery on the lower floor is a completely equipped blacksmith and repair shop. There is provision for storing under cover-freight and supplies brought from the Beach over the tramway; also a spur track from the main railroad line to lower level, providing transportation beyond the terminal. A steam heating plant has been installed in this terminal building, to prevent ore from freezing in the bins.

(4) At the mine, a large double-drum hoist with full motor equipment, cages, etc., was installed, which necessitated cutting a large station and rope raise on the 1,050-foot level. Further, a high voltage line with transformers was laid from the tunnel power house along the 2,200-foot level and up the shaft to the crusher room and on to the hoist station. On the 1,800-foot level a station 20 by 20 by 30 feet was cut, in which was installed a crusher having a capacity of 100 tons an hour. The enlarged operation at the mine necessi-

tated putting in an additional air line, which was provided by laying 12-inch casing from the tunnel power house along the tunnel and up the shaft to the 1,050-foot level. In addition, a railway motor generator set and a compressor having a capacity of 3,631 cubic feet of air, were installed in the tunnel power house.

(5) To accommodate these improvements, the enlargement of the power house at the tunnel was necessary, so the building was extended 30 feet and the required foundations for water wheels, generator set, and compressor were put in. A locomotive repair shop was constructed. A cement mortar powder house, 22 by 22 feet, was erected alongside the railway line at a distance of about 3,000 feet from the tramway terminal; this gives storage capacity for 1,800 cases of explosives. Rolling stock, consisting of two electric locomotives, each 15 tons, and ten 20-ton self-dumping ore-cars, and four of 7-ton capacity, were put in service during the latter part of the year. To control the skips on the incline a 25,000-lb. double-drum lowering and hoisting apparatus, with 75-h.p. motor, was installed in a station, dimensions 40 by 40 by 20 feet, cut in solid rock at the head of the incline.

(6). For the accommodation of employees, thirty-nine dwelling houses were built—nineteen at the Beach and twenty at the Tunnel camp. Of the former, one is a 5-room, sixteen are 4-room and two are 3-room dwellings; of the latter, two are 8-room, one 6-room, four 4-room, and thirteen 3-room dwellings. A 3-storey store building, 60 by 26 ft., was also erected.

(7). The first 1,000 ton unit of the new concentrating mill, together with slime and concentrating tanks, and a launder to the sea, were completed during the year. In addition, the second unit was enclosed, all machinery foundations completed, and a part of the machinery installed.

(8). A new wharf, 120 ft. long by 60 ft. wide, with freight house, 30 by 30 ft., was constructed at the Beach.

Note.—The following summary shows what the outlay was on the various works included in the foregoing brief account of construction, equipment, etc., during 1915::

| Expenditure on— | |
|---|---|
| (1) Water supply, dams, etc. | $56,294.74 |
| (2) Pipe lines and steam plant | 184,565.04 |
| (3) Railway, incline, ore storage bins, aerial tramway terminal | 110,061.78 |
| (4) Mine hoist, station, electrical equipment, air line | 62,533.90 |
| (5) Additions to power house, other buildings, railway rolling stock, equipment of incline, etc. | 64,973.56 |
| (6) Dwelling houses and store | 50,724.58 |
| (7) Completion of concentrating mill, machinery payments, etc. | 222,162.47 |
| (8) New wharf at Britannia Beach | 7,919.60 |
| | $759,235.67 |
| Some other expenditures— | |
| On property purchases | 100,000.00 |
| Prospecting, exploration, surveying, etc... | 44,633.61 |
| | $903,869.28 |

These items have been grouped together in this way, though not thus shown in the general manager's report, to give an adequate idea of what the company's main expenditures were last year, apart from the ordinary outlay on mine development, ore production, etc., which is included in the Statement of Operations previously given.

Miscellaneous.—During the latter part of the year this company bought the Howe Sound Power Co., which owned important water rights on Furry creek, in South valley, the power possibilities of which it is intended to develop and conserve by a system of dams, intakes and pipe lines, thus materially increasing this company's hydro-electric development.

The establishment of a telegraph office at Britannia Beach has proved a great convenience in expediting the business of the company.

A favorable contract was negotiated with the American Smelting and Refining Co., for the treatment of the Britannia ore products, for a period of seven years from July 15, 1915.

Owing to the increased price of copper and the fact that other producers had advanced wages, a voluntary increase was made to the company's employees during the latter part of the year. The policy of the company in taking the best of care of its employees has enabled it to create an efficient and loyal organization, which is being continually built up to care for the larger tonnages that are expected to be realized shortly after the first of the new year.

General.—It is proposed to carry on in 1916 an extensive prospecting campaign. This includes driving a tunnel from a point near the head of the incline in an easterly direction, this to be known as the 2,700 ft. tunnel, and simultaneously another tunnel, to be known as the 4,100 ft. tunnel, is to be driven from a point at the back of the new concentrating mill. For the present, the latter will be driven only far enough to admit of connection being made by raise with the 2,700 ft. tunnel. These tunnels are to be driven 9 by 13 ft., thus making them large enough to serve as underground transportation routes from the mine direct to the mill. They will exploit new ground where there is a possibility of encountering commercial ore (of which surface showings give promise), and in the event of ore being found while driving them, their cost may be entirely offset by the value of the ore to be extracted.

The 1,600 ft. level will be extended westerly from the shaft to the Jane-Bluff ground, and a raise be made to the surface at a suitable place for ore extraction. There will also be other exploration and development of that part of the property which has been proven by diamond drilling to contain ore of commercial value.

It is also intended to do development to the east and south of the Fairview claim, this to include a vigorous prosecution of work in the Beta tunnel, which is being driven west to connect with a drift east from the shaft on the 1,600 ft. level, a distance of 3,000 ft.

The test runs in the 1,000 ton unit of the new mill gave favorable results. It is believed that, with the transportation arrangements completed, 2,500 tons of ore a day can readily be delivered to the combined milling plants. The company possesses a very large quantity of what might be termed low grade ore, but whether a further enlargement of the concentrating mill will be found advisable will depend upon the disclosures from the development work above outlined, and from other development work contemplated.

The further conservation of the Britannia watershed, the harnessing of the water power of South valley, the extensive plan of development work decided on, and the various items of new construction that will be entailed, will together involve expenditure of large

sums of money, but it is expected that more than enough for these purposes will be derived from production operations.

Balance Sheet.—As at December 31, 1915, the Liabilities and Assets were as follows:

Liabilities.—Capital, issued and fully paid, 91,966 shares of $25 each, $2,299,150; loans, from Howe Sound Co. $1,186,966.13, Tacoma Smelting Co. $53,000, total $1,239,966.13; accounts payable and December payrolls, $191,275.18; sundry reserves, $72,030.32; depreciation, $854,634.68; profit and loss, $821,589.37; total, $5,478,645.37.

Assets.—Properties, Crofton townsite $50,200, Britannia mines $2,070,744.31, total $2,120,944.31; plant, buildings and machinery, Crofton smelter (inoperative $260,030.12, Britannia Beach and mine $1,557,971.18, under construction $725,847.76, total $2,543,849.06; investments, Britannia Power Co., Britannia stores, etc., $405,738.19; supplies and construction material, $124,289.11; accounts and bills receivable, $226,844.59; cash in bank, $56,456.24; sundries, $524.18; total, $5,478,645.68..

## MINING ON VANCOUVER ISLAND

Among other speakers at the annual meeting of the Victoria, B.C., Board of Trade, held on April 14th, was the Hon. Lorne A. Campbell, Minister of Mines for British Columbia, who delivered an address on matters in which the Province generally, and Vancouver island particularly, are directly interested. Concerning mining, Mr. Campbell observed:

"Mining, in British Columbia, in addition to being prosperous, is taking on new phases. Zinc, for instance, is assuming an importance not before understood. Copper is almost certain to have a place in the metal markets that it never had before and the prices to be maintained for some years to come. With Granby and other mines in the Boundary, Granby at Anyox and the Britannia mines in Howe Sound productive, and prospective developments, we are bound to make British Columbia a factor in the markets, which, of course, has not been the case in the past. You know that when you begin to compare British Columbia's output in copper or in any other metalliferous product with the rest of the America, not to speak of the rest of the world, our place in the sun is as yet very small. The production of copper in British Columbia, as compared with that of the United States, is only about as one to twenty; but, basing my estimates on known operations and mining undertakings, I am quite safe in saying that next year, if not this, the copper output will be more than double what it was last year, so that in a very few years, in copper, and in other metalliferous products as well, we shall have a place in the sun. You are more particularly interested in the mineral resources of Vancouver Island. The most recent professional estimate of coal reserves in British Columbia is 76,034,942,000 tons—a figure so vast as to be beyond our ability to conceive what it means. Of that reserve, of what is left after more than sixty years of continuous mining, there are 1,060,000,000 tons left on Vancouver Island. When we remember that the total output of those over sixty years is less than 30,000,000 tons, we have a good many years to go before the reserve is exhausted, even assuming that no new discoveries are made. Coal mining on Vancouver island has been handicapped recently, owing to the substitution of oil for fuel. Your market has always been limited to Coast consumption and probably always will be, and, therefore, one of the problems of practical men and the Mines Department is how coal may be utilized so as to restore it to its former status of production and possibly greatly increase it. We have to study it in connection with the development of the manufacture of iron, of which you have vast deposits. I use the word 'vast' deliberately. We have to study it as to the extent and value of its many by-products. We may reasonably hope, too, that, with the increase of population and industrial establishments, notwithstanding the competition of oil fuel, the market for Vancouver island coal will, on its present basis, very materially expand.

"While at the present time the output of metalliferous minerals on this island is relatively small, there is, I believe, good reason to expect a marked improvement in the near future. It should not be forgotten that when, from 10 to 15 years ago, the Tyee and Lenora mines on Mount Sicker were being operated, they were productive to quite an important extent. Production figures given by Mr. C. H. Clapp, of the Geological Survey of Canada, in his Memoir 13, Southern Vancouver island, show a total output of ore from three Mount Sicker mines—about two-thirds of it from the Tyee mine—of approximately 250,000 tons of ore, containing about 23,000,000 lb. of copper, 690,000 oz. of silver and 42,000 oz. of gold. Calculated at present prices of these metals, the total value of that production would be in excess of $7,000,000, all from a comparatively small area on Mount Sicker. Surely we are not justified in assuming that there are not other similar extensive and valuable deposits of ore on Vancouver island. On the contrary, there appears good reason to expect that when conditions shall be favorable—ample money for exploration and development and low-cost transportation facilities for machinery and supplies to, and for ore from, mining properties not now easily accessible, we shall see achieved the establishment of metalliferous mining on a profitable basis. At Sooke, where there are good copper prospects; in the country about Great Central lake, where ten years or more ago much interest was taken in the large ore showings of the Big Interior property; on Quatsino sound, where the big deposit of low-grade ore on the Yreka company's claims was found; on another group, also in Quatsino division, now having the attention of Spokane mining men, and in still other instances where, by reason of lack of capital and transportation facilities, little or no progress has been made—all these are decidedly encouraging indications of the occurrence of much mineral awaiting development and utilization. Now that modern methods make it possible to treat low-grade ores at a much lower cost than was the case ten to twenty years ago, there should be found on this island a promising field for enterprise in connection with metal mining."

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Provincial newspapers have published the statement that the total value of the gold bullion received at the Dominion of Canada Assay Office at Vancouver, B.C., during the fiscal year ended March 31st last, was $2,798,000.

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The Standard Underground Cable Co. of Canada, Ltd., announces that its Montreal branch office is now located in the McGill Building, instead of the New Birks Building as heretofore.

# PERSONAL AND GENERAL

Mr. G. G. S. Lindsey is expected in Toronto this week.

Mr. A. A. Cole is to address the Canadian Club of North Bay on June 29, on "The Importance of the Mining Industry in the North."

Mr. G. C. Bateman, manager of La Rose mine, was in Toronto this week and is now in Colorado.

Mr. J. M. Callow, who recently visited Cobalt in connection with the installing of oil flotation plants, has returned to New York.

Mr. H. D. Symmes is to be manager of the Boston Creek Gold Mines, the company which will operate the R .A. P. mine at Boston Creek, Ont.

M. Beatty & Sons, Welland, have recently been awarded contract by the Dominion Bridge Company for two 9 x 12 link motion hoisting engines with cut steel gears, and two 60 in. x 156 in. vertical boilers built under Ontario inspection for use on the Intercolonial Railway car ferry terminals at Carleton Point, P.E.I., and Cape Tormentine, N.B.

Dr. Otto Sussman, of New York, who is a director of the company owning the well-known Interstate-Callahan zinc mine, situated near Wallace, in the Coeur d'Alene district of Idaho, was at the mine last month.

Mr. J. V. Richards, of Spokane, Washington, has been making an examination of the Florence Mining company's silver-lead-zinc mine, near Ainsworth, B.C., for that company, which has its headquarters in Spokane. Mr. F. R. Wolfle, the company's general manager, has also been at the mine from Spokane lately.

Mr. Howell John, for some time superintendent of a coal mine in Nicola Valley district of British Columbia, has returned to Nanaimo, Vancouver island, where he expects to again be connected with coal mining.

Mr. H. Y. Walker, of the Tacoma smelting works, Puget Sound, Washington, was a recent visitor to the British Columbia Bureau of Mines, Victoria.

Mr. Dudley Michell, instructor in first aid and mine rescue training work for the British Columbia Department of Mines, left Victoria on June 22, to attend, first the meeting of the Western Branch of the Canadian Mining Institute at Sandon, Slocan, on 27th inst., and next a first aid and mine rescue work demonstration arranged to be held at Coleman, Alberta, on July 1.

Mr. E. J. Conway, of Vancouver, B.C., on the Granby company's mining engineering staff, recently visited mining properties on Queen Charlotte islands.

Mr. Barclay Bonthrone, of Vancouver, B.C., has been visiting mining properties in country along the Grand Trunk Pacific Railway, east of the Skeena district of British Columbia.

Mr. Raleigh P. Trimble, who has for several years been actively engaged in connection with the development of mineral claims in the neighborhood of Rocher Deboule mountain, near Hazelton, Omineca mining division, last month returned to that region after having been absent for a while at Portland, Oregon, and other parts of the United States.

Prof. W. A. Parks, of Toronto, arrived in Victoria, B.C., early in June to resume his investigations, for the Canada Department of Mines, relative to the building and other stones of Western Canada.

According to the Rossland Miner, Mr. H. H. Claudet was expected to leave Denmark in May for Ontario. Mr. Claudet has for years been a representative of the company controlling the Elmore vacuum oil process.

The following news item from the Similkameen Star, printed at Princeton, British Columbia, is of interest: Last week the Star mentioned that Hugh Campbell, of Princeton, had taken out is 53rd miner's license. While the record is a good one, Edward Stout, of Yale, has it beaten by six years. Stout, who will be 91 years old in September, last month took out his 59th license.

Mr. Thomas Graham, chief inspector of mines of British Columbia, has been elected president of the Mine Inspectors' Institute of the United States.

H. R. Plommer, who for the last eighteen months has been accountant and sales manager for the Middlesboro colleries at Merritt, has accepted a position with the B. C. Copper Co. at Greenwood, B.C.

The following news item was printed in Vancouver Island newspapers about the middle of June: "Mrs. D. McLean, of Vancouver, B.C., has been notified from Ottawa that her husband, Donald McLean, had been officially reported missing since June 2. Donald McLean was well known in Ladysmith, and if he has made the supreme sacrifice, the sorrow will be universal, but the hope that he has escaped with his life, even if he should be a prisoner in the hands of the enemy, will be general." Mr. McLean, who until his enlistment for active military service, was principal of the School of Mines at Ladysmith, which is the residence town of nearly all the miners employed at the Extension colliery of the Canadian Collieries (Dunsmuir), Ltd., held a British Columbia first-class certificate of competency under the "Coal Mines Regulation Act, 1897." It is noteworthy that on the same date as he obtained it, January 21, 1905, others on the list of those who successfully passed the examination for manager's certificate were Messrs. R. W. Coulthard and J. Richardson Roaf, both now military officers energetically engaged in organizing battalions, in Alberta and British Columbia, respectively, for service at the Front. Mr. McLean joined the Canadian Mining Institute in 1911.

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## COPPER-NICKEL MATTES.

In a paper written for the Arizona meeting of the American Institute of Mining Engineers, Prof. G. A. Guess of the University of Toronto and Mr. F. E. Lathe of Grand Forks, B.C., describe an investigation into the flowing temperatures of copper-nickel mattes and copper mattes. The investigation was started with the idea of determining whether copper-nickel mattes might not have a lower flowing temperature than copper mattes, and thus perhaps aid in accounting for the difficulty so far experienced in attempts at pyritically smelting copper-nickel ores.

The authors conclude: "The results of these experiments have not shown as great a difference in flowing temperature between copper and copper-nickel mattes as was expected. Copper-nickel mattes appear to have a flowing temperature from 30 deg. to 50 deg. below copper mattes of the grade usual in blast-furnace work. This slight difference in temperature does not appear to us to be sufficient to explain failures in pyrite smelting due to a too early liquidation of copper-nickel matte in the furnace."

# SPECIAL CORRESPONDENCE

## NEWFOUNDLAND

### Copper Mines.

The copper mines at Little Bay and Betts Cove are being reworked after being closed down for more than ten years. At both places from thirty to fifty men are employed, in mining and collecting the large quantities of ore that have been lying on the surface since the mines were last worked. The ore at Betts Cove is of a particularly high grade, large quantities of which give analyses of more than thirty per cent. copper. Tilt Cove, Little Bay and Betts Cove are only a few miles apart, and there are outcroppings of the ore at intervals between these places.

Batts Hill mine, Conception Bay, has about fifty men employed. A large part of the ore that is being taken from this mine is being locally smelted at the plant of the Hydro Electric Smelting Co. Extensive developments are expected to take place on this mine this year.

### Coal.

The coal field in the region of St. Georges Bay is perhaps the most promising though not the most extensive in the country. This has been traced in a longitudinal line from W.S.W. to E.N.E. five miles, and is thought to extend a little further. Mr. Howley Head of the Geological Survey said of this field: "The best exposures of coal are near the western end of the trough Here it shows a width of about two miles. In the section exposed along the banks of the Barrisway river there are twelve coal seams ranging from a few inches to over five feet in thickness. On the Robinson's river two miles further east three seams were uncovered, one of which, the Howley seam, gave a thickness of four feet two inches."

During the past few years a number of well known mining experts have visited these areas both on behalf of the Government and of private parties. All reported most favorably on the prospects and the facility with which they could be worked.

It is not unlikely, therefore, that through sheer necessity some development work will be begun on some of these deposits this season, as no matter what the initial cost of mining the coal may be it is safe to say that the present prices prevailing will guarantee a safe margin of profit for those who undertake the work.

The iron mine at Snow's Pond, near Brigus, on which some development work was done two years ago by the Mining Engineer of the Reid Newfoundland Co., has been taken over by a company in the United States, who are prepared to spend one hundred thousand dollars on the property during the summer.

Mr. W. A. Mackay, who has been instrumental in having a smelter erected at St. John's, is at present in United States securing new linings for the furnaces.

The operators are experiencing some difficulty in securing sufficient men to work on the lime quarries at Port-Au-Port, owing to the large number of men enlisting in the army and navy.

At the present time there are a number of mining engineers in the country, mostly from United States, examining different mining properties with a view to buying or having the same worked.

### Wabana Iron Mines.

Work in the mines of the Dominion Iron and Steel Co.'s mines and those of the Nova Scotia Steel Co., at Wabana, still continues with unabated vigor. Several cargoes of ore have been taken away during the past month, and the only check on the extent of these operations is the severe scarcity of tonnage suitable for the work of freighting the ore. Quite a number of men who were employed in these mines during last winter have left the island to engage mostly in the fisheries. This withdrawal of large numbers of men will not, however, be felt so severely as might be expected, as both companies have already mined and placed on the surface enormous stock piles of ore aggregating not less than one million tons. With the excellent shipping facilities which both mines have at their disposal, in the nature of great automatic steam shovels, loading chutes and the endless chain bucket system, a large amount of work may be done with a minimum of labor. It is understood that both companies are well supplied with orders, sufficient to warrant active operations in mining and shipping all during the summer, and up to the close of navigation About seventeen hundred men are at present employed by both companies.

### Copper Smelting in Newfoundland.

Under the caption of "Will make a fortune," the Mail and Advocate, one of the largest and best informed daily newspapers in the country, says recently: "We learn to-day from a very good authority that Mr. W. J. Mackay is about to close with an American company for the sale of his copper smelter in the West End (of St. John's), at a very good figure. We also hear that Mr. Mackay will sell his right to the copper on the dump at Little Bay. It is further said that the company has offered him one dollar per ton for the material, and as there are hundreds of thousands of tons of it there Mr. Mackay will clean up a fortune, as he well deserves to do, in reward for his pluck, enterprise and ability." This smelter was opened early last winter, and since then has been running regularly, turning out four hundred pounds daily of high grade copper. The smelter has been of considerable benefit to the country, inasmuch as owners of holdings all over the country were induced to test their deposits by submitting small lots to the smelter to test its value, and in this way some valuable deposits were disclosed, and beginnings are about to be made on some of the holdings thus tested.

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**Boston Creek Inn, Boston Creek, Ont.**

Work in connection with another electric smelter has begun at Little Bay, once a famed mining district in the country, but of late years lying unworked. A dam 45 ft. wide and 20 ft. deep is under construction on Burkes river, a stream running through this district. At one of the old mines a number of men are employed on the dumps, and considerable ore is being extracted and placed ready for smelting. As soon as the smelting begins, mining underground will commence.

**Tilt Cove Copper Mine.**

The Tilt Cove mine is working at a fairly good clip, two loads of ore have been taken away by steamer during the past month. There are employed at the Tilt Cove mine at the present time about 250 men. The mine still shows no signs of exhaustion, and operations are expected to become more brisk later in the season.

During the present month an engineer from Boston examined the Bob's Head copper property, in the interests of an American party who are negotiating for the purchase. The ore is of good grade. Shafts sunk on the property are 80 and 50 ft. deep each. It is likely that a sale will be consummated within a few days, and work will begin on a moderate scale on the deposits.

**Lead.**

Work is progressing on the small lead mine at Dublin Cove, near Rose Blanche, considerable ore is on the surface, and it is not unlikely that increased activity will be in evidence during the summer on these holdings. The fine property in the district of Port-au-Port, which was worked on a small scale some years ago is likely to be taken over by some Americans who intend working it.

**Newfoundland Products Corporation.**

The Newfoundland Products Corporation, which intends the establishment of a colossal industry, at the cost of $21,000,000 in the country, in the manufacture of the salt ammonium phosphate (for fertilizing purposes), ammonia and cement, has at present employed over the areas on which they intend erecting the plants a large staff of men engaged completing the survey, which was begun last summer, and continued when the spring opened two months ago. It is doubtful whether or not construction operations will be attempted this summer; this will largely depend upon the rate of the survey.

The chief interest in the corporation is held by the Reid Newfoundland Co. of St. John's, Newfoundland. The Reid Co. are the owners of the entire railway system in Newfoundland, as well as of a large fleet of steamers doing passenger and freight service around the country. To produce ammonium phosphate, the chief and primary object of the corporation, five ingredients are necessary, namely: phosphate rock, sand, coal, marble, and pyrites—and it is assured that with the exception of phosphate rock, which at first is to be imported from Florida, all the other substances necessary can be produced in Newfoundland. This together with the large concessions granted the corporation by the Government, in the nature of water powers, etc., induced them to locate their industry here. The industry contemplated, when the plant is in full working order, will necessitate 29,805 tons of sulphate rock, ing order, will necessitate 239,805 tons of sulphate rock annually, or 657 ton sdaily, 600 tons of coal daily, 411 tons of limestone daily, and 29,200 tons of pyrites each year. This will produce 120,000 tons of ammonium phosphate, the value of which at $80 per ton will be $9,600,000 per year.

**Newfoundland Coal Supply.**

The Government anticipating a coal shortage throughout the country, owing to the scarcity of tonnage for freight, unless steps were taken to forestall what was impending, took up the matter of coal importation from Nova Scotia early this spring, and as a result the returns show the amount of coal imported to date to be 44,000 tons, which is considerably ahead of last year's importations for the same period, and is sufficient to prevent any severe shortage in the near future.

The SS. Kite, one of the wooden sailing fleet, has been chartered by a party of Americans to cruise for minerals in the Arctic regions during the summer; the Kite left last week for New York.

## BRITISH COLUMBIA

Summer weather was being expected in the lower Coast district in the middle of June, but the season had been backward, so that field work was late in being generally undertaken. In parts of the interior, too, there has been delay in connection with mining, but late reports are to the effect that much progress is now being made. Advices from Cariboo told of snow having fallen about the middle of the month, which, however, is good news, since it means some addition to the water supply for gravel-washing purposes.

**East Kootenay.**

The output of the **Sullivan** mine for May was comparatively large; the total quantity of ore received at Trail from this mine during the month was 7,978 tons. Other receipts were restricted to a carload each from the St. Eugene and Monarch mines, together 54 tons. The total for the month from the district was, therefore, 8,032 tons.

In the first week in June receipts included 20 tons of ore from the **Giant** mine, Spillimacheen, Golden division, which had been non-productive for seven years, following lack of success commercially with some concentration experiments. It was claimed at the time that the Elmore oil process made a good separation, but was too expensive in its operation to be continued. The two "Texas tables" were put in, but these, while doing excellent work under favorable conditions, evidently were not found suitable to ordinary requirements intreating the bulk of the ore occurring here. The Provincial Mineralogist included the following in some of his published notes: "On the Giant group, situated on the left bank of the Spillimacheen river, about seven miles in from Spillimacheen landing on the Columbia river, and at an altitude of about 3,500 ft. on the southwest side of Spillimacheen mountain, there appears to be a line of contact of limestone on the south with a black colored slate on the north. Along this line of contact the lime seems to be more or less completely altered into barytes for a width of from 20 to 30 ft., when the barytes gives place gradually to a silicification of the limestone. This zone of barytes is in parts heavily impregnated with galena to the extent of from 5 to 10 per cent., together with some zinc, arsenic, and antimony sulphides. The galena is fine-grained, and occurs in numerous small seamlets running through the barytes gangue, and contains silver value in about the proportion of one ounce to the per cent. of lead. As far as could be determined by inspection, the mineralization diminished with the barytes, both being strongest next to the slate."

### West Kootenay.

**Ainsworth.**—Four ore shippers from this division were on the Trail list for May, namely: Bluebell 621 tons, Comfort 25 tons, Florence 39 tons and Highland 249 tons; total 934 tons. Zinc ore was shipped by two or three other mines, but no particulars are available at the time of writing. As roads improve, so that heavy hauling may be resumed, an increase in output is looked for.

**Slocan.**—From the head office of the Rambler-Cariboo Mines, Ltd., Spokane, has come a report, as follows: The net earnings of the Rambler-Cariboo Mines, Ltd., operating the **Rambler-Cariboo** mine and concentrating mill near Three Forks, were approximately $11,000 in May. An advice just received from Supt. W. E. Cameron states that he is mining a considerable quantity of shipping ore from the 700 ft. level and other parts of the mine. At present prices for metals the crude ore nets about $5,000 for each 35 ton car, as compared with $3,500 for a similar quantity of silver-lead concentrate, for the last returns from the smeltery showed that a car of 34½ tons of concentrate netted $3,483. May shipments were 160 tons of lead and 70 tons of zinc concentrates, the return from which will be about $18,000. Expenditures during the month were larger than usual, because of heavy purchases of explosives, and will total about $7,000. Owing to a scarcity of suitable men we have been unable to recruit our force to permit operating the concentrating mill full time, but we expect to soon have a third shift working.

It has been announced that practically all of the new equipment purchased with the proceeds of the $70,000 bond issue floated in Spokane about four months ago, has been received at the **Slocan Star** mine, near Sandon, and part of it installed. The new machinery includes a 15-drill compressor, a 1,500 h.p. electrical plant, flotation process appliances, additional concentrating tables and an aerial tramway half a mile in length.

Mines in the Silverton region are active, those on the producing list comprising the Standard, Hewitt, Lucky Thought and Galena Farm. Three of them continue to ship zinc as well as lead products; the Lucky Thought is sending lead ore to Trail, but is not making a zinc concentrate, as are the others.

**Nelson.**—The Daily News states that 37 men are being employed at the **Granite-Poorman** mines, situated about five miles from Nelson, and that about $6,000 is being expended monthly in connection with the operation of these mines, approximately $4,000 in wages and the remainder for materials. The 20-stamp mill is running steadily on ore from the new workings on the Hardscrabble vein, which was further developed by a shaft sunk last winter. About 350 tons of ore is being crushed weekly; part of the gold content is saved by amalgamation, and part is in the concentrate sent to the smeltery.

**Rossland.**—The report of Josie mine, Rossland, for the month of April, has been received at the head office, London, of the Le Roi No. 2, Ltd., from the company's managers at Rossland, as follows: Ore shipped to the smeltery at Trail, 1,585 tons. Receipts from the smeltery were $16,871, being payment for 1,204 tons of ore; sundry receipts were $393; total of receipts was $17,263. Expenditures for corresponding period were: Ore production, $8,400; on capital account, $1,085; for development (including diamond drilling), $7,100; total, $16,585.

The following is a summary of Josie shipments and accounts for the four months, January-April, of 1916: Ore shipped to smeltery, 5,628 tons; concentrate shipped, 50 tons. Receipts were:: For 4,603 tons of ore, $63,616, and for 96 tons of concentrate, $2,640; sundries, $1,966; total receipts, $68,222. Expenditures were: On ore product3ion, $2,3845, and on milling, $400, making a total of working costs $25,245; on capital account, $4,128; on development, including diamond drilling, $36,381; total expenditures, $64,754. (Note—The concentrating mill was operated only during a part of January, and not at all during the three other months of the period under review).

### Similkameen.

The Similkameen Star, published at Princeton, the chief town of Similkameen district, lately printed the following: "Business conditions are better generally, and mining particularly, is the report Mr. Ernest Waterman, general manager for the Princeton Coal and Land Co., brings home after having spent two weeks in Spokane and on the Coast. While in Spokane Mr. Waterman was approached by the officials of the big central heating system with a proposition for shipping the slack coal from the Princeton colliery for use in their plant. With an extremely low freight rate, it is thought such a scheme could be worked. On the Coast there were rumors to the effect that the Canadian Pacific, Grand Trunk Pacific and Canadian Northern Pacific Railway Companies were planning to reconvert their locomotives to coal burners and discontinue the use of oil as fuel, which change would be a great advantage to the coal mining industry of the Province."

The Lucky Todd Mining Co. recently made a small shipment of ore copper from its claims on Greenhorn mountain to the smeltery at Greenwood, with results stated to be sufficiently encouraging to warrant having another carload packed down to the railway in Otter valley. Efforts are being made to secure the construction of a wagon road from the railway to the claims.

### Vancouver Island.

Supplementary to the information relative to the proposed reopening of the Tyee Copper Co.'s smeltery at Ladysmith, Vancouver island, sent for publication in the last number of the Canadian Mining Journal, is the following excerpt from the Daily Colonist, Victoria, of June 14: "During his visit to Ladysmith last week, Hon. Lorne Campbell, Minister of Mines, visited the smeltery and had a long conference with Mr. W. J. Watson, manager for the Tyee Copper Co. Mr. Watson showed Mr. Campbell over the smelting works, and the latter was very much impressed with what he saw, expressing surprise that a plant so modern and up-to-date in every respect had remained idle so long, while the ore that should have been smelted at Ladysmith had been shipped to the United States for treatment. He says there is enough British Columbia ore now being shipped to the United States from Coast mines to keep the local smeltery working constantly, and he will give the matter his immediate attention. Mr. Campbell had not the slightest hesitation in saying that the Tyee Co.'s smelting works will again be in operation before long. Ladysmith people who are interested in the reopening of the smeltery can be assured that there will be nothing left undone than can be done by the Department of Mines to provide an adequate supply of ore to keep the smeltery running full time."

### General Notes.

Plant and machinery has been removed to Sandon Slocan from the concentrating mill at the Alice mine, near Creston, within 20 miles of Kootenay Landing, which latter is the western terminus of the Canadian Pacific Railway Co.'s Crowsnest branch railway. It is stated that some of this machinery will be added to the equipment of the concentrator of the Slocan Star Mines, Ltd.

Well-known men resident in Vancouver city are reported to have acquired some mineral claims on Rocher Deboule mountain, in Omineca mining division. They have organized the New Hazelton Gold-Cobalt Co., and several of those chiefly interested left Vancouver in June to visit the claims and decide where to do development work on the property.

Mine owners operating in the British Columbia part of the Crowsnest district, Southeast Kootenay, are interested in a movement among their employees, who have demanded a ten per cent. increase in wages as a war bonus. The executive board of District 18, United Mine Workers of America, requested the Western Coal Operators' Association to arrange for a joint meeting of the two associations to consider this demand.

## COBALT, SOUTH LORRAIN & GOWGANDA

### The Price of Silver.

After falling 13 cents in twenty-eight days, the drop in the price of silver has definitely stopped with the week ending June 23rd. There has never been any uneasiness in the camp that it would go to a point where the profits would likely be jeopardized. World conditions are such that to those watching the market from the outside, it appears likely that silver will again advance to the point attained earlier in the month. There has no doubt been every effort made on the part of purchasing Governments to keep down the price as low as possible, so that when big orders have been put in it is hoped that the price will drop again until the stocks of silver are depleted. It is then generally anticipated that the price will once more rise with the same startling rapidity as before. The remonetization of silver is becoming a live subject in all circles where silver operators meet. If this course is taken by the nations of the world after the war, it will mean large and permanent profits for all silver operators, and it is difficult at the present time to see how it would be possible to avoid such a course. In any case there is no uneasiness as to the immediate price of silver during the next four or five months. In fact many companies are now holding their ore until such time as the price does rise again. They have made good profits from cars marketed at a time when silver was 75 and 76 cents an ounce, and they can now afford to withhold their silver for some time. Another factor in the situation is the burning of the refinery at the Nipissing.

### Labor Disputes.

As the outcome of several meetings held by the working miners in the Cobalt camp, it appears most likely that arbitration will be sought before any strike is attempted. In fact, the local union has given notice that they will apply for a conciliation and investigation board and they have definitely gone on record to the effect that they will not strike until such board has been refused. It is a grievance with them that the mine managers will not meet the Western Federation of Miners. They do not appear to recognize the fact that the record of the Western Federation of Miners in the West is almost a complete bar to any negotiations between it and mine owners. There would be no disposition at all to avoid a meeting of the representatives of almost any other union except the Western Federation. There is a pretty general feeling that owing to the high cost of living, further concessions might be made to the men, particularly in view of the fact that silver has fallen below the point where the surface men will get any bonus, but it will require a tactful and skilled mediator. If such is provided, there is every hope that a peaceful settlement of the disputes will be provided.

### Discovery at Crown Reserve.

The Crown Reserve Mining Company has run into a shoot of ore at the 700-ft. level which is exciting a great deal of interest in the camp. The vein is about a foot wide, of massive smaltite and calcite. All this material is studded with heavy flakes of native silver. Smaltite will run about 100 oz. to the ton and across the foot of vein matter the average will be 500 oz. to the ton. At the time of writing, this vein has been developed for 12 ft. At the 500-ft. level, $40,000 was taken from this vein. The ore is typical diabase ore, but the exact formation in which the vein is located at the 700 ft. level has not been definitely ascertained. While it is far too early yet to base any hopes upon this discovery, it has excited much interest, and if the vein continues, will be conducive to much more exploration in the formation line below the conglomerate, in the Kerr Lake section of the Cobalt camp.

The Crown Reserve Mining Company is very busy with prospects; not only in Northern Ontario, but in California. While they have thrown up their option on the Globe, they have taken other options on the Reward mine in Inyo County and other prospects. The Reward mine has been a profitable producing mine in its day and there is ore in sight. It is understood that the option has been obtained at quite favorable terms. In Northern Ontario the Crown Reserve has taken up its option on the Cochrane mine. The shaft will be sunk to the 500-ft. level before any further work is attempted on the upper levels, where some mill ore was blocked out by the General Assets Company, when they had a lease. The company has decided to give up their option on the McRae claims in Boston Creek, and they have taken their machinery away. They still have the Johnston claims, just east of the R. A. P. Syndicate.

### Oil Flotation.

The success of the oil flotation process in the Cobalt camp has now been assured, by the good results obtained in the McKinley-Darragh plant. While all experimental work at the Buffalo was most satisfactory, most mining companies have held back until such time as the process was proven to be profitable under regular mill practice. This is now well assured at the McKinley-Darragh plant. The first results obtained when some later improvements had not been applied, was a tail of 2 oz. from an 8 or 9 oz. head. This compared with 3 to 5 oz. from the same slime head. Later results have given a 1.7 oz. head and there is every prospect that this will be reduced later to a 1 oz. head. As has been said, the success of oil flotation with tails from water concentration plant is practically assured, but experiments on tails from cyanide process are still going ahead and the definite proving of its applicability to this practice in the camp has not yet been actually demonstrated. The Coniagas, Northern

Customs and Penn-Canadian have experimented with the callow system and will probably install it; at the Beaver another system of oil flotation is being tried. That the net result of the application of oil flotation to tails from Cobalt ores will be a saving of a large quantity of silver that previously went into the tailings dump, is now almost certain.

**Mining Corporation Changing Mill.**

Construction is actively being prosecuted at the Cobalt Reduction mill of the Mining Corporation. All ore from the Townsite, the City of Cobalt and the Cobalt Lake is now being milled at this plant and the Cobalt Lake mill has been closed down. Ore from the Cobalt Lake is now trammed underground to the main working shaft of the Mining Corporation, near the Cobalt Reduction mill. Extensive alterations are being made in the plant of the Mining Corporation. A new refinery is being built and a Marcey mill is at the present time taking the place of several batteries of stamps. The results obtained in this tube mill are to date so satisfactory, that it is quite possible that it will substitute some of the stamps in the Mining Corporation's plant. The Mining Corporation is now the largest actual producer of bullion in the camp, although the Nipissing ships more than they do, since they take a good deal of customs ore from the Kerr Lake and other mines.

**People's Mine.**

Work has actually commenced on the People's mine in Southeast Coleman. This work is to be carried on jointly by the Ophir Cobalt and the People's Mining Company. It was decided between the two companies that it would be more economical to sink the shaft on the John Black. This shaft is now down 310 feet, and it will be carried on to the contact with the diabase, which is expected to be found just above the 600-ft. level. Then a crosscut will be started from the No. 1 vein on the People's, which dipped out of the shaft. It will probably be picked up in about 70 feet and the drift on it will be carried on to the Ophir line; a distance of about 150 feet. Until that point is reached, all expenses will be shared by the Ophir and the People's Mining Company; after the crosscut has passed the line, expense will be borne according to the number of machines running. It is not probable that any definite results can be obtained until the late fall.

**Beaver.**

The Beaver shaft is now down to a point where the contact with the lower keewatin should be reached at any time. The station has been cut at the 1,650-ft. level. The diamond drill showed that keewatin should be entered at 1,680 ft., so that in the next two or three weeks, crosscuts to pick up veins should be started at any time. Once these are well under way, results may be obtained at any time. The progress of the work is being watched with a great deal of interest.

**Peterson Lake.**

The Peterson Lake Mining Company showed a surplus of $277,376. While the company has failed to discover any silver that could be mined at a profit on any of the leases that they are working, the income from the Seneca Superior has sufficed to give them working capital for their own operations and only reduced the surplus by about $27,000. There is no attempt to hide the fact that the Seneca Superior is the main source of income of the Peterson Lake and that the Seneca Superior is now practically worked out. Sir Henry Pellatt, in his address, says in part that "towards the end of the year the ore reserves of the Seneca were practically depleted and extensive development of the leased area did not lead to the discovery of any new orebodies. Your directors have diligently prospected the Peterson Lake area through Nos. 2 and 3 shafts by extensive underground workings, and have opened up the Nova Scotia territory in which several veins have been encountered. Up to the present time commercial silver has not been found in paying quantities." The fact that the Seneca Superior has this year declared and paid no less than 70 per cent. on their capitalization, insures Peterson Lake an income from their royalties on this mine at least as substantial as in 1915. There should therefore be no need of anxiety either in regard to working capital or dividends during the present year, but unless something is found this year, surplus will have to be drawn upon to finance operations in 1917.

## PORCUPINE, KIRKLAND LAKE AND BOSTON CREEK

**A Proposed Merger.**

What promises to be of benefit to both participants if it goes through as at present drafted, is the merger of the Porcupine Vipond and the North Thompson. These two properties lie side by side and one mines the extension of the other's veins. It would therefore be simple to connect up workings and mine both from a central shaft. While both properties are of promise, the tonnage they would separately produce would not be large enough to reduce mining and milling costs to a point where profits would be very large. If the merger is effected, the present Porcupine Vipond mill which is now treating about 125 tons a day will be enlarged to treat 400 tons a day. The decreased costs of milling and mining would make it possible to develop and extract ore of a grade that is not now profitable. The Porcupine Vipond is now a producing mine with a mill. The North Thompson is developed on three levels with a fourth now being opened up, all in good ore; but they have no mill and under present war conditions find it difficult to finance the building of one. The project has been under discussion now for some time; Mr. Hamilton, the chairman of the Huronian Belt Company controlling the North Thompson mine, coming over from England to discuss the matter with Mr. Ward, of the Porcupine Vipond and the directorate. While final details have not been settled and papers have not been signed, it is most probable that the merger will be consummated as arranged.

**Hollinger.**

The Hollinger Mining Company showed a small decrease in gross profits for the period ending May the 19th. This was altogether due to the fact that the grade of ore fell from $9.09 to $8.00. Of the 30,586 tons hoisted during the 28 days, none came from below the 550-ft. level and only 2,110 tons came from the 550-ft. level itself. The mill ran 90.7 per cent. of the possible running time, treating 42,673 tons, of which 29,509 tons was Hollinger ore and 13,083 tons were treated for the Acme mine. The gross profits for the period ending May the 19th were $194,369, 33,558 tons of $8.00 ore. The total costs were $3.336 per ton. Milling cost 0.933 cents and mining $1.774. Both mining and milling showed a slight reduction per ton. Progress is being made with the foundations for the new mill and forms for the concrete foundations have now almost been completed. The drifts and crosscuts on the Acme and Hollinger are being joined up, so that the whole system will soon be unified.

### Dome Lake.

The cyanide drum at the Dome Lake mine has proved to be a metallurical success, but it is still quite defective mechanically. One of the chief troubles is the breaking of the porous tiles with which the drum is lined, owing to the drum being somewhat out of line. The rollers upon which the drum runs have worn unevenly and it moves with a motion that breaks the tiles. The replacing of these lines is a matter of some difficulty and time and the drum has only been enabled to run a certain portion of the regular time. Its maximum capacity is 60 tons, made up of 5 charges of 12 tons each, per day. This may be increased later by some modification of feed. When the drum is not running the tails from the amalgamation plates run into the tailings pond and will have to be retreated later. The heads to the mills are running pretty high, owing to the opening up of some fine grade ore in a raise above the 300-ft. level on the No. 1 vein.

### Stamps and Ball Mills.

The controversy between the advocates of stamps and ball mills will receive a fresh impetus by the determination of the Dome to pull out all their old stamps and install 8-ft. Hardinge mills, which have been such a success at the Dome. Two of these mills are now in place in the Dome mill, although but one of them is running. Three more are on order. It is reckoned that the five-ball mills will do the work of the 100 stamps, without much difficulty.

### West Shiningtree.

What may be a new gold camp has recently come into some prominence in the West Shiningtree district. It is known as Wasapica. It is thirty miles southwest of Gowganda and about twenty-five miles from milepost 80 on the C. N. R. It is in Churchill Township on the west branch of the Montreal River. A shaft has been sunk in the andesite for 32 ft. on the Caswell claim. On the surface there is an 18-inch vein of quartz, about 4 inches of which is remarkably rich ore. On the Knox claim which is being operated by a Buffalo syndicate, a shaft has been sunk 40 ft. on a vein 18 in. wide, which on the surface ran $34.20. At 40 ft. the vein widens out to 2 ft. 6 in. A chisel sample across 18 in. of this vein ran $176 to the ton. Perhaps the most important, although the least spectacular of the working groups in this section is the Bourke. It is under option to a Cobalt syndicate, at the head of which is Mr. R. B. Watson. The main vein which will average about 2 ft. for 400 ft. shows very little gold, but gives consistently good assays. There are a number of quartz stringers running into this vein and these quartz stringers are very rich. This new field can be reached either through Sudbury and the C. N. R., or through Gowganda and the west branch of the Montreal River.

### Boston Creek.

At Boston Creek the R. A. P. Syndicate holdings have been taken over by the Boston Creek gold mines. Messrs. Albright & Richardson still remain in control of the holdings, but Mr. Papassimakes has sold out most of his interest, although he still retains a small block of stock and is a director. The other directors of the company are Messrs. H. D. Symmes of Niagara Falls and J. P. Bickell, of Toronto. Mr. Symmes will be the manager of the company, Mr. Papassimakes going into Painkiller Lake to develop some properties he has under option there.

The Boston Creek gold mines will at once proceed to develop their holdings on a much larger scale. The shaft is now down about 180 ft. At that depth there is 4 ft. of very rich ore. The shaft will be continued down to the 200-ft. level, when a diamond drill will be installed to discover the exact bearing of the vein. The Kenzie claim and the Boston Creek Townsite are also included in the merger. It is proposed to install a much larger power plant at once and probably in a short time build a mill.

### Power For Kirkland.

The power line from Cobalt to Kirkland Lake via Boston Creek, has actually been commenced. Men are now engaged in cutting out the right-of-way, which has been purchased, and the poles should soon begin to go up. From Cobalt to Kirkland Lake is a distance of 65 miles, and under the circumstances, it is most unlikely that power will be available before the snow flies. Once it is available developments through Catharine Township, Boston Creek and Kirkland Lake will be very much accelerated.

## PORTABLE SMELTERS.

In its last issue, Northwest Mining Truth, published in Spokane, Washington, made the following editorial comment:

A member of the British Columbia Parliament, during a recent discussion in the House, suggested that the Government show its interest in the mining industry by supplying smelting facilities to isolated mines. The proposition appears to have met with some smiles and not a few outbursts of more plebean laughter. The honorable gentleman was not, however, cast down by this vulgar clamor and it is quite probable that the next slogan in British Columbia politics will be, "Every little mine must have a smelter of its own." It is possible that the plan would prove expensive in practice, but by proper supervision of details the Government may be able to "get by" without bringing bankruptcy upon the province. We realize that alien advice is not sought in such contingencies, but we nevertheless suggest that a start might be made by the erection of a nice, complete little smelter on wheels. It could be tried out upon different kinds of properties until it eventually found a permanent resting place on some lone hospitable mountain where self-fluxing ores are abundant. Its chaffeurs must, however, be careful that the wheels do not slip and land it on the dump of oblivion. We opine that the Honorable H. C. Brewster is a man of initiative and that ignorance of a subject does not deter him from laudable efforts to make the world better and richer. We are also inclined to believe that he has not graduated from the primary class of any reputable school of mines.

## SILVER PRICES.

| June— | New York. cents. | London. pence. |
|---|---|---|
| 10. | 63¼ | 30¼ |
| 12. | 64⅞ | 31 |
| 13. | 63⅞ | 30½ |
| 14. | 63 | 30⅛ |
| 15. | 62⅞ | 30 1/16 |
| 16. | 63⅛ | 30 3/16 |
| 17. | 63⅞ | 30½ |
| 19. | 64¾ | 30 13/16 |
| 20. | 64⅛ | 30⅝ |
| 21. | 64¼ | 30 11/16 |
| 22. | 65 | 31 |
| 23. | 65⅜ | 31 3/16 |

# MARKETS

## NEW YORK MARKETS.

June 23, 1916—Connellsville Coke—
Furnace, spot, $2.40 to $2.50.
Contract, $2.50 to $2.75.
Foundry, prompt, $3.25 to $3.50.
Contract, $3.50.
June 23, 1916—Straits, Tin, 40.25 cents.
Copper—
Prime Lake, nominal, 26.62½ to 26.87½ cents.
Electrolytic, nominal, 26.62½c to 26.87½ cents.
Casting, nominal, 24.00 to 24.25 cents.
Lead, Trust price, 7.00 cents.
Lead, outside, 6.85 to 6.95 cents.
Spelter, prompt western shipment, 11.92½ to 12.17½ cts.
Antimony—
Chinese and Japanese, 18.50 cents.
American, 18.50 cents.
Aluminum, nominal—
No. 1 Virgin, 98-99 per cent., 63.00 to 65.00 cents.
Pure, 98-99 per cent., remelt, 61.00 to 63.00 cents.
No. 12 alloy, remelt, 48.00 to 50.00 cents.
Nickel, 45.00 to 50.00 cents.
Cadmium, nominal, $1.25 to $1.50.
Quicksilver, nominal, $76.00.
Platinum, nominal, $75.00.
Cobalt (metallic), $1.25.
Silver (official), 65⅜ cents.
Metal Products—Following base prices are all f.o.b. mill:
Sheet copper, hot rolled, 37.50 cents.
Sheet copper, cold rolled, 38.50 cents.
Copper wire, 30.00 to 31.00 cents.
High sheet brass, 38.00 to 39.00 cents.
Seamless brass tubing, 43.00 to 44.00 cents.
Seamless copper tubing, 43.50 cents.
Brazed brass tubing, 45.50 to 46.50 cents.
Brass wire, 38.00 to 39.00 cents.
Brass rods, 38.00 to 39.00 cents.
Sheet zinc, f.o.b. smelter, 19.00 cents.

## TORONTO MARKETS.

June 26—(Quotations from Canada Metal Co., Toronto)—
Spelter, 18 cents per lb.
Lead, 8¾ cents per lb.
Tin, 46 cents per lb.
Antimony, 25 cents per lb.
Copper, casting, 29½ cents per lb.
Electrolytic, 30½ cents per lb.
Ingot brass, yellow, 16 cents; red, 21 cents per lb.
June 26—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $8 per ton.
Coal, bituminous, $5.75 per ton.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto, Ont.)
Toronto, June 26,1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Atlantic Steel | 50.00 | 53.00 |
| Butte | 4.62 | 5.00 |
| Can. Car | 65.00 | 70.00 |
| Curtiss Aeroplane | 42.00 | 49.00 |
| Chevrolet | 216.00 | 220.00 |
| Cosden Oil | 16.00 | 16.25 |
| Cuban Sugar | 56.25 | 57.00 |
| Can. Copper | 2.62 | 2.75 |
| Chandler Motors | 111.00 | 111.25 |
| Canada Cement | 68.25 | 68.50 |
| Con. Ariz. | 1.37 | 1.44 |
| Emma Copper | 44.00 | 46.00 |
| First National | 3.25 | 4.00 |
| Houston Oil | 14.00 | 17.00 |
| Howe Sound | 4.00 | 4.25 |
| Intercontinental Rubber | 12.00 | 14.00 |
| Inter. Nickel (New) | 45.25 | 45.75 |
| Kennecott Copper | 48.00 | 48.50 |
| Manhattan Transit | 1.00 | 1.25 |
| Maxim Munitions | 6.00 | 6.25 |
| Midvale Steel | 62.00 | 62.25 |
| Marconi | 3.12 | 3.37 |
| Magna | 13.00 | 13.50 |
| Mother Lode | 27.00 | 28.00 |
| Poole Engineering | 115.00 | 120.00 |
| Peerless Motor | 24.00 | 25.00 |
| Ray Hercules | 3.25 | 4.00 |
| Steel of Canada | 58.00 | 59.00 |
| Standard Shipbuilding | 5.00 | 12.00 |
| Submarine Boat | 36.00 | 37.00 |
| Salpulpa Oil | 12.00 | 12.50 |
| Success | 77.00 | 78.00 |
| Tonopah Extension | 5.25 | 5.50 |
| Triangle Film | 2.18 | 2.25 |
| U. S. Light | 2.87 | 3.00 |
| Ventura Oil | 8.75 | 9.25 |
| White Motors | 56.00 | 56.50 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex | .07 | .07⅜ |
| Dome Consolidated | .10 | .... |
| Dome Extension | .37 | .37½ |
| Dome Lake | .32 | .32½ |
| Dome Mines | .... | 27.25 |
| Eldorado | .... | .00½ |
| Foley O'Brien | .48 | .... |
| Gold Reef | .01½ | .02 |
| Hollinger | 29.55 | 30.00 |
| Homestake | 55 | .... |
| Jupiter | .32½ | .33 |
| McIntyre | 1.57 | 1.60 |
| McIntyre Extension | .40 | .44 |
| Moneta | .13 | .14 |
| Plenaurum | .40 | .70 |
| Porcupine Crown | .80 | .88 |
| Porcupine Imperial | .03¾ | .04 |
| Porcupine Tisdale | .01⅝ | .02 |
| Porcupine Vipond | .55 | .57 |
| Preston East Dome | .04¾ | .05 |
| New Ray | .40 | .41 |
| Teck Hughes | .21½ | .22 |
| West Dome Con. | .38 | .38½ |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac | .70 | .72 |
| Bailey | .08 | .08¼ |
| Beaver | .40½ | .41 |
| Chambers-Ferland | .20 | .24½ |
| Coniagas | 5.00 | 5.60 |
| Crown Reserve | .54½ | .55½ |
| Foster | .... | .09 |
| Gifford | .05½ | .06 |
| Gould | .00¼ | .00½ |
| Great Northern | .04 | .05 |
| Hargraves | .03½ | .04¼ |
| Hudson Bay | 47.00 | 52.50 |
| Kerr Lake | 4.25 | 4.50 |
| La Rose | .59 | .65 |
| McKinley | .52 | .54 |
| Nipissing | 7.10 | 7.15 |
| Ophir | .06½ | .08½ |
| Peterson Lake | .24¾ | .25 |
| Right of Way | .05¼ | .05½ |
| Seneca Superior | .30 | .32 |
| Shamrock Cons. | .10 | .12 |
| Silver Leaf | .02 | .02¼ |
| Temiskaming | .63½ | .54 |
| Trethewey | .23¼ | .24 |
| York Ontario | .01¼ | .... |

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## ALPHABETICAL INDEX TO ADVERTISERS


A

Allan, Whyte & Co. ..... 2
American Zinc Lead & Smelting Co. ..... 10

B

Bath, Henry & Son ..... 13
Balback Smelting & Refining Co. 13
Beatty, Blackstock, Fasken, Cowan & Chadwick ..... 12
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd..... 4

C

Campbell & Deyell, Ltd. ..... 11
Canadian Copper Co..... 6
Canadian Explosives, Ltd. ..... 5
Can. Ingersoll-Rand Co., Ltd..... 1
Canadian Inspection & Testing Laboratories, Ltd. ..... 11
Canadian Laboratories, Ltd. ..... 11
Canada Metal Co. ..... 12
Cohen, S. W. ..... 11
Consolidated Mining & Smelting Co. ..... 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. ..... 13
Curtis's & Harvey .....
.....Outside Back Cover

D

Darling Bros., Ltd ..... 6
Dept. of Mines, Canada.....
.....Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd..... 9
Dominion Engineering & Inspection Co. ..... 11
Dorr Co. ..... 11
Dwight & Lloyd Sintering Co., Inc. 7

E

Escher Wyss & Co. ..... 3

F

Ferrier, W. F. ..... 11
Fleck, Alex. ..... 9
Forbes, D. L. H. ..... 11
Fraser, W. ..... 9

G

Gartshore, Jno. J. ..... 12

H

Hassan, A. A. ..... 11
Hendrick Mfg. Co. ..... 6
Hersey, Milton Co., Ltd. ..... 11
Heys, Thomas & Son ..... 11
Hitchcock, C. H. ..... 11

I

Imperial Bank of Canada ..... 6
Industrial & Technical Press, Ltd.
.....Outside Back Cover
International Nickel Co. ..... 6

J

Jeffrey Mfg. Co. ..... 10
Johnson, Matthey & Co. ..... 11

L

Ledoux & Co. ..... 11
Lymans, Ltd. ..... 3

M

Murphy, Chas. J. ..... 11
Mussens, Ltd..... 10

N

Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 3

O

Orillia Molybdenum Co. ..... 9
Ontario, Province of .....
.....Inside Back Cover

P

Pacific Coast Pipe Co., Ltd ..... 6

Q

Quebec, Province of ..... 8

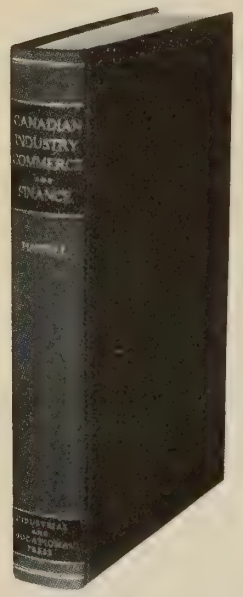
S

School of Mining..... 9
Segsworth, R. F. ..... 12
Smart Turner Machine Co. ..... 7
Smith & Durkee Diamond Drill Co. ..... 12
Smith & Travers Diamond Drill Co. ..... 12
Smith, Sydney ..... 11
Spearman, Chas. ..... 11
Standard Underground Cable Co.. 9
Sullivan Machinery Co. ..... 2
Summerhayes, Maurice W. ..... 11

T

Temiskaming & Northern Ont. Ry. 4
Tyrrell, J. B. ..... 11

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The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

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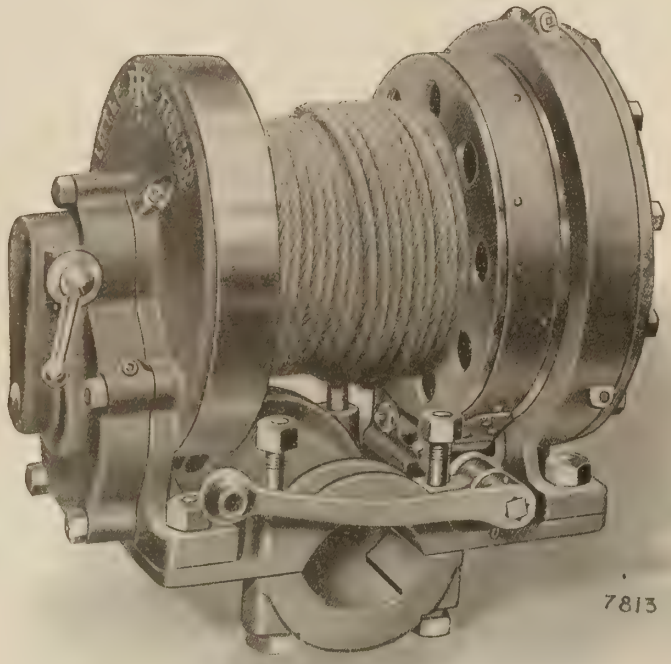
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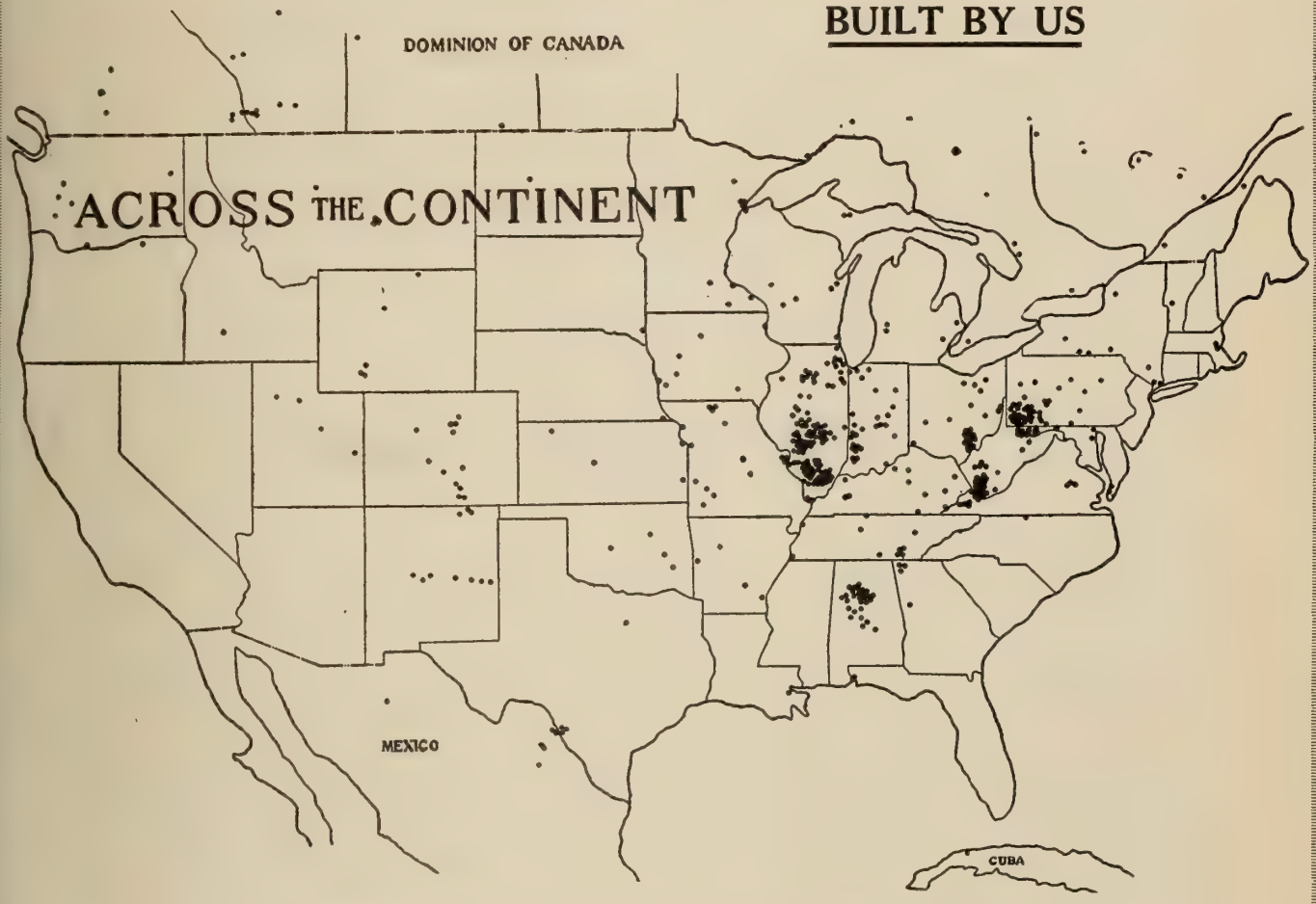
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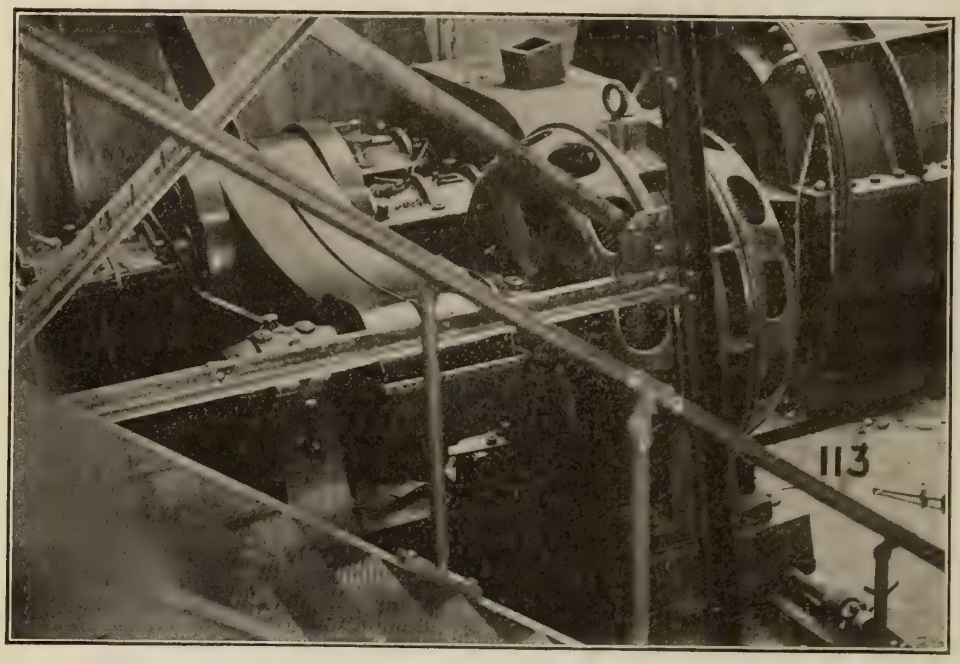
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, July 15, 1916. No. 14

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CONTENTS

| Editorials— | Page |
|---|---|
| Mining Copper Ore in Ontario | 335 |
| Selling Nickel to Germany | 336 |
| Mining at Great Depth | 336 |
| Canada's Future, by David H. Browne | 337 |
| Professor William Nicol | 338 |
| Coal Trade of Nova Scotia during the first half of 1916, by F. W. Gray | 339 |
| Design for a Gate Front, by A. E. Hall | 341 |
| Utilization of Zinc | 342 |
| Progress in Underground Ore Loading, by M. E. Richards. | 344 |
| Benzol, by Geo. Taylor | 348 |
| United States Tungsten Production in 1915 | 349 |
| Personal and General | 355 |
| Special Correspondence | 356 |
| Markets | 358 |

## MINING COPPER ORE IN ONTARIO

There are in Ontario many copper deposits. The most notable ones are the nickel-copper deposits of the Sudbury district, from which there will be taken during 1916 ore containing about 22,000 tons copper, in addition to 40,000 tons nickel. Aside from the nickel-copper mines, however, very little copper has been produced recently in Ontario.

Encouraged by the high price of copper some enterprising gentlemen have during the past year been giving their attention to the possibilities of the country between Sudbury and Sault Ste. Marie. From one property a considerable quantity of good ore has been shipped and development work is meeting with encouraging results. Several other properties along the north shore of Lake Huron are said to be worthy of development.

The development of the copper mining industry in Ontario is retarded by the fact that there is no sale for the ore here. The nickel-copper companies have, of course, their own large smelters and refineries; but those who engage in copper mining on a small scale must necessarily ship their ore to smelters in the United States. The high cost of marketing the product is discouraging and permits of only fairly high grade ore being shipped.

There are few mines that produce enough ore to warrant the erection of a smelter and refinery. From the small mine ore is commonly shipped to a smelter which treats ore from many mines. The producer of copper ore in Ontario is therefore in somewhat the position of the farmer who depends on his neighbor for the threshing of his wheat. Fortunately for the farmer threshing machines are numerous and can be readily brought to his fields. The miner soons learns that smelters are few and far away and that freight and smelter charges are very large items.

It is obvious that the establishment of a copper smelter and refinery in Ontario would lead to the more vigorous development of small copper deposits. It is obvious also that the copper ore now being shipped is not sufficient to support a smelter. There is not, moreover, sufficient information to indicate that enough deposits to keep a smelter busy would be developed if the plant were erected.

There is no doubt that a close investigation of the possibilities of Ontario copper deposits would be helpful. The area north of Lake Huron seems particularly worthy of attention. The high price of copper and the possibility of utilizing the oil flotation process of concentration are features which make the problem of unusual interest just now.

## SHIPPING NICKEL TO GERMANY

The United States is the greatest consumer of nickel, but depends almost entirely on Canadian ores for its supply. It can export nickel only by importing from Canada more than it needs for its industries. We have been advised by the Federal Government that satisfactory arrangements for preventing Germany from obtaining Canadian nickel have been made, and we are advised by newspaper despatches that nickel is piled on the Deutschland's pier ready for shipment. The spectacular trip of the submarine has again directed attention to the nickel question and particularly to the various sources of nickel used in the United States.

According to the official report of the United States Geological Survey for 1914, the latest final report available, no nickel ores were mined as such in the United States during that year, but an equivalent of 845,334 pounds of metallic nickel, valued at $313,000, is understood to have been saved as a by-product in the electrolytic refining of copper. A part of this nickel was marketed in the form of sulphate and part as electrolytically deposited metal. Mr. Frank L. Hess, the author of the report, says: "It is impossible to tell how much of this nickel was derived from foreign ores, but a considerable part—possibly one-third to one-half—was produced from domestic ore."

During 1914 there was refined in the United States a small quantity of rich matte imported from Belgium and obtained from the smelting there of New Caledonia ores.

When it is borne in mind that Canada exported to the United States in 1914 matte containing 36,015,642 pounds nickel, the American sources other than Canadian appear almost negligible. The amount of nickel produced from the United States ores, even if it should all come into the hands of German agents, constitutes no great menace.

There are other sources than the refineries that have to be considered, however. It is reasonable to assume that since the war began German agents, experiencing difficulty in purchasing nickel at first hand, would be able to purchase no mean amount from those having on hand stocks of raw and scrap nickel accumulated before the Canadian arrangement went into effect.

The appearance of this nickel on the Deutschland's pier emphasizes the necessity of guarding against leaks. It does not prove, of course, that the agreement with the International Nickel Company is not being lived up to. The episode shows, however, that in spite of the fact that the Canadian Government acted promptly in arranging to keep nickel from the enemy it would be very much to our advantage if the refining of the matte were done in Canada.

The episode also reminds us that many months have elapsed since the nickel company promised to erect a refinery in Canada. It emphasizes also the advisability of having that refinery of sufficient capacity for handling all the matte produced.

There is small comfort in the fact, if it is a fact, that the nickel to be shipped on the Deutschland is not of Canadian origin. There should not be allowed to be shipped to the United States more nickel than is needed there. If any is to be exported to Europe we, the chief producers, should export it ourselves.

Unfortunately we must for the present, since we have no refinery here, be satisfied with shipments being made to the Allies from the New Jersey refinery instead of direct. If, however, the nickel company senses the feeling of Canadians it will not much longer delay the erection of a nickel refinery in Canada and it will look forward to doing all its refining here.

## MINING AT GREAT DEPTH

Compared with the temperatures at the surface the temperatures met with in most Canadian mine workings are moderate and fairly uniform. At the depth of a few hundred feet the miner is protected from extremes of cold and heat, and can work efficiently at any time of the year. Experience in many parts of the world has shown that many mines are hot at comparatively small depth and that all very deep mines are hot. Some mines are hot because of purely local conditions, while heat at great depth is common everywhere.

An unusually interesting example of increase in temperature in depth is afforded by the world's deepest mine—the Morro Velho mine, situated in Brazil. An article on the ventilation of the Morro Velho was published in our Aug. 1, 1915, number. Additional information is contained in the recently issued report of the St. John Del Rey Mining Company.

The Morro Velho is a gold mine which is producing nearly $200,000 per month. Most of the ore is coming from a depth of over 4,000 ft. below the surface, and the shafts have reached a depth of 5,826 ft.

The company has made a very careful investigation of conditions at depth. It has been found that the increase in rock temperature in the Morro Velho mine is 1° Fahr. for every 125 ft., while the increase in air temperature, resulting from compression of the air as greater depth is attained, amounts to 1° Fahr. for every 180 ft. At the bottom level during the hottest months of the year the temperature averaged 107 degrees.

Commenting on the temperature in which the miners work at the bottom level, the superintendent, Mr. G. Chalmers, says that the men, being used to high temperatures at surface, do not seem to mind it, and that "they are invariably only too anxious to work overtime if the opportunity is given them." Mr. Chalmers is, however, making many improvements in ventilation and plans to overcome further increase in temperature by cooling and drying the air going into the mine and by drawing off the air after allowing it to pass over only one or two stopes instead of allowing it to pass up through several stopes.

# CANADA'S FUTURE*

By David H. Browne.

Down here in New York, when we get together, Canadian, Englishmen and Americans who know Canada, one topic is sure of discussion; that is the future of the Dominion. Upon one thing we are all agreed; that this war has pulled the country together as nothing else could have done. The National Consciousness is self evident. It jumps to the eyes, as the French say. With this feeling of unity to begin with, great progress in organization and large developments in commenrce and industry follow inevitably. At present these rest upon an abnormal condition, and whether these benefits can be retained in normal times is a serious question.

Let us talk it over, as we do here around a lunch table, for many a true word is spoken in jest and it is by such informal conversation that sentiment crystallizes into belief and belief into action.

Our good friend Gilbert Rigg, who has gone to Australia to assist the smelting of zinc and lead in the Commonwealth, is a man of great intellectual penetration. He gave me some very good ideas before he left, and to these I have added some of my own. I will lay the whole before you, in the same spirit of indifference with which the waiter hands you the menu and lets you choose for yourself. My only comment is to inform you that I wrote those parts which strike you as sound and logical. The ideas which are evidently foolish and visionary Rigg must take the blame for. He is on the Pacific now and cannot help himself.

This war has taught us a good many things, but the one thing of all others which it has taught us is to look a fact squarely in the eye without blinking. If we can apply to the future of our industries that same clarity of vision which we apply to the purposes of this war, we may be able to see a path through the wilderness.

In the first place, we can admit at once that men are not all they should be. There would not be such a large percentage of rejections at our recruiting stations, or such a number of men dropped from the paymasters' books every month in our industries, if the average of physical and mental efficiency were satisfactory. All these agencies for doing us good must have some reason for existence.

Yet any recruiting officer can tell you of men, who, once rejected, have made themselves fit and joined the colors; every shop foreman knows of mechanics who made a failure in one position only to make a success in another; and the records of all religious revivals are full of instances of drunkards and wastrels who have become decent, self-respecting citizens.

Evidently, reform is quite possible, but in every case it is to be noted that whatever agency has given the initiative, reform is an effort of the will, in answer to an overpowering conviction. Reform in every case comes from within, and is achieved by the surrender of a man's individuality to some ideal. This possession of some ideal, reasonably attainable and constantly striven for is what distinguishes the man from the human machine.

So in dissecting the ideas of those who propose to make the world better by changing men's natures, we can agree with them that anything which gives man higher ideals is worth while. There is really something in this position that men can be made better, and any agency which attempts this is worthy of encouragement.

So as far as these agencies can create an ideal in men and make them better men, they fill their part.

The main idea of life, however, is to be happy and to make other men happy; and into this happiness enter the conditions we find around us, many of which require to be changed.

Looking back over this preachment, we do not seem to have made much progress, Rigg and I. It is dry reading so far and does not seem to lead anywhere. Light a pipe and read ahead. Give us a chance.

Some while back one of us said that the war has taught us to see clearly. One of the things it has taught us to see is that men will unite, work together, suffer together and die together in order to achieve some common purpose which appeals to them as desirable. They are trying to realize certain conditions which seem to them to be good, and to rectify certain other conditions which they look upon as abhorrent. Further, they do all this on their own initiative as impelled by one purpose.

Admit that a good many enlist "because everybody is doing it." Everybody wouldn't be doing it if there was not some ideal seen by all and more clearly seen by some. Put it into concrete terms, and the argument is somewhat like this: Certain principles are at stake, certain ideals which we believe to be right are menaced. Our national existence and our future welfare depend on what we do now, upon what I do this minute. Plainly then, "it is up to me."

There you have it, the idea of individual service for a common ideal, which is to retain and maintain certain conditions of life.

These conditions of life which appear so highly desirable are summed up for us in one word—Canada. It's our country; it's a white man's country. It's home and mother and wife and children and all that's good. It's a place where a man has a chance, where one can go ahead and make something of himself, and where our children can go further and fare better than we have done. This isn't simply patriotism, it's a fact, a concrete something that we can lay our fingers on.

Now for this fact, in order to perpetuate this fact, men will join the colors and fight and suffer and die. In this service they meet conditions which appeal to them, which are so real and vital to them that when they come home wounded they are anxious to get back to some muddy ditch where they may go through the same experience and do their bit all over again.

What is it they find in this service that calls them in such an irresistible way? The main thing seems to be the common purpose; the feeling that they are getting something done, that must be done and that they alone can do. They feel their own individuality and their own personal worth.

This feeling of individual responsibility, the necessity of giving the best that each has is emphasized by the fact that in the ranks the former distinctions of caste are entirely lost. Eating, sleeping, working together, the laborer, the clerk, the employer, the poor man and the rich man, the scholar and the professor, all thrown together in the same service, come to know each other and to understand each other in a way that is never realized in normal times. The trenches are a

*Extracts from July bulletin of the Canadian Mining Institute.

great school of democracy, and the lessons learned there will never be forgotten in the life of those who take their part there.

Now the question for us is this: How can we preserve for Canada those lessons of devotion to a common cause, this feeling of self-respect which comes from service well rendered, and this mutual understanding and good will? The mere temporary acquisition of these has been worth while, but how much more worth while would it be to perpetuate these qualities not for three years, or for the life of the war, but for thirty years, the life of a generation! Conceive of this concerted action and mutual confidence applied to politics and statecraft, to education, to municipal affairs, to commerce and industry, and to every phase of our national existence, and think what Canada would gain thereby. Surely there must be some way in which this best that has been brought out can be made part of our permanent good.

One thing seems indisputable. All this unanimity of action springs from the feeling of individuality, and any system which seeks to perpetuate it must take into cognizance the human and individual element.

The great thing brought out by this war is that "he does his bit" not because he has to, but because he wants to. He "belongs." It is his: his war, his regiment, his trench.

Now how can we carry that feeling over? Evidently the only way is by making each man feel that he "belongs" just as much in his industry as in his regiment.

Now a great deal may be done by considering what are the causes of industrial discontent. It is not an answer to say that this strike was caused by a demand for higher wages, and that this lockout was brought about by the question of the recognition of the unions. These are only the superficial causes. Back of these are certain mental attitudes which must be clearly understood if we are ever to get at the cause of misunderstandings. Unions are only a concrete expression of individual feelings. Strikes are only a combined effort to remove a personal grievance. If both employer and employee, a company and workmen, boss and laborer, each understood and sympathetically understood the other's ideas, industrial unrest would be reduced to a minimum.

Let us look a little more closely into the things that really count, and let us find out, if possible, what are the things that are wrong in our industries, and see if there is not some way to make them right. Things are not all they should be, for if they were everybody would put the same effort into industrial service and their daily work that they now put into military service and the arts of war.

Yet war is an abnormal condition, and peace is normal. If we could put this same energy we now expend into the every day work of life, our conditions of life would be vastly improved and most of our ideals would be easily realized. The war has made men better simply because it has brought out the best that was already in them. It has shown us certain conditions of life which bring out that best. Can we make this habit of mind and these mutual relations permanent? Can we perpetuate this self respect, this feeling of individual responsibility, this confidence in our fellows, this belief in an attainable ideal, and this willingness to do our best to secure it? That is our problem.

Some loss of enthusiasm is certain. When the "tumult and the shouting dies" it is inevitable that the personal vigor and exaltation, the discipline and unanimity of purpose must suffer. These are collective virtues in which the "mass action" plays its part. Yet the other lessons of self reliance, of mutual confidence, of orderly habit, of personal pride in one's work have been deeply ingrained in the minds of many thousand men. These men will come back to work, bringing these changed personalities to their old tasks. Unless we can meet them half way, see things from their side and get them to see things from the other side, all this good is lost.

Can we not retain some of it? I think we can. Rigg thinks we can. What do you think about it?

## PROFESSOR WILLIAM NICOL

It is given to few men to accomplish so much for his university and for his country as has been done by Professor William Nicol, whose state of health has made it necessary for him to retire from the chair of mineralogy in Queen's.

Professor Nicol is one of a small group of men to whose indefatigable and unselfish labors the School of Mining at Queen's owes its very existence. Early in its history he set himself to create for the use of the students a collection of minerals that should represent the mineral industries of Canada, actual and possible, and that should be theirs while they were students of Queen's. As a result of his labors there is now available such a collection for students' use as cannot be duplicated, it is safe to say, in any university in America. Other results of Professor Nicol's activities are the unique large scale specimens of economic minerals—specimens, one may say, on the ton scale—for some of them weigh over a ton. While he has never allowed himself to sacrifice the interests of the students to the display features of a museum, he has nevertheless been able to make the museum of economic minerals in Ontario Hall a place of real beauty and general interest.

Professor Nicol's students are known everywhere for their thorough and extensive knowledge of minerals —a result of his exact scholarship and enthusiasm as a teacher. But they honor him not only as a teacher, but as a sympathetic, generous and true-hearted friend.

For a quarter of a century Professor Nicol has given such service to his university. To this he has added many gifts of a more tangible kind. It is a well-known fact that often when the university purse was empty Professor Nicol has not spared his own pocket, when he saw an opportunity of adding to the mineral collections or otherwise usefully extending the equipment of his department. His name will always be associated with the home of the metallurgy department, Nicol Hall, the building of which was made possible by his generosity.

Professor Nicol's extensive knowledge of minerals, and, one may be permitted to add, his skill in acquiring the choicest specimens of them, have brought him into intimate association with the mining men of Canada and the United tSates. He has always been a welcome guest in the mining camps, where his jollity and good stories are well known. Mining men and all his other hosts of friends will join the Journal in expressing regret that he is obliged to retire from active work and in adding the hope that he may long be spared to enjoy his well-earned leisure.

# THE COAL TRADE IN NOVA SCOTIA DURING THE FIRST HALF OF 1916

By F. W. Gray.

Approximate figures of the outputs of the Nova Scotia coal companies during the first half of 1916, with comparative figures for the first six months of the two preceding years, are as follows:

| | First Six Months of | | |
|---|---|---|---|
| | 1914. | 1915. | 1916. |
| Dominion Coal Co.— | | | |
| Glace Bay Mines... | 2,254,000 | 2,075,000 | 2,153,000 |
| Springhill Mines .... | 200,000 | 199,000 | 189,000 |
| N. S. Steel & Co. .. | 396,500 | 256 300 | 288,000 |
| Acadia Coal Co. .... | 207,600 | 144,000 | 200,000 |
| Inverness C. & Ry. Co. | 125,800 | 103,000 | 138,000 |
| Intercolonial Coal Co. | 170,000 | 90,000 | 66,700 |
| Maritime C. & Ry. Co. | 73,500 | 76,000 | 102,000 |
| Minudie Coal Co. ... | 31,000 | 38,000 | 32,000 |
| Colonial Coal Co. ... | 26,000 | 20,000 | 20,000 |
| Cape Breton Coal & Ry. Co. . . . . | 12,000 | 6,000 | ..... |
| | 3,496,400 | 3,007,300 | 3,188,700 |

The situation of the coal-trade at the close of the first half of 1916 is exactly the reverse of what it was at the corresponding date a year ago. At the 30th June, 1915, the output showed a decrease of about 430,000 tons compared with the first six months of 1914, the bulk of the decrease being attributable to depressed conditions during the first quarter of 1915, and it was forecasted that the production of coal would show a marked improvement during the closing half of 1915, as was actually the case. At the 30th June, 1916, the production compared with the first half of 1915, shows an increase of approximately 180,000 tons, the bulk of this increase being to the credit of the first quarter of 1916. It may now be forecasted that the production of the second half of 1916 will show a marked decrease when compared with the last six months of 1915. The figures for 1916 at the end of April showed a much more favorable comparison with 1915, and during May and June a heavy falling off in production took place. For example the production of the Dominion Coal Company's Glace Bay collieries were as follows during May and June in the two years:

| | 1915. | 1916. |
|---|---|---|
| May . . . . . | 428,000 | 353,000 |
| June . . . . . | 448,000 | 336,000 |
| | 876,000 | 689,000 |

Decrease: 187,000 tons.

Indications are that the coal production for the year will be at least 500,000 tons below the small ouput of 1915, and may not exceed 6,000,000 tons. That is to say, the production of coal in Nova Scotia during 1916 is going to be 1¼ million tons below the normal capacity of the collieries, and it will be necessary to hark back to 1911 to find so small a provincial coal production as apparently we are to see in 1916.

This is a matter of first rate importance. Some nine months ago, the writer ventured to point out that the question of recruiting among miners was resolving itself into a choice between men and munitions, and in a review of the Nova Scotia coal-trade for 1915, once more emphasised the inevitable tendency towards a serious drop in the production of coal. The fact that the outputs of the first quarter of 1916 were greater than the output in the first quarter of 1915 obscured the true tendency of events, and it was not realised by those who made these comparisons that the prodution of coal during the first quarter of 1915 was at the lowest possible ebb.

Enlistments in the mining district have for some months past been discontinued, but the damage has been done, and outputs cannot now recover until "the boys come home."

The reduction in production is not solely due to recruiting. It is in part due to the requisitioning of the coal-freighting steamers by the Admiralty. This condition has affected the Dominion Coal Co. in particular. During the winter this Company has four large steamers for its winter business, two of which the Admiralty requisitioned. As a consequence of the reduction in carrying capacity it was not possible to take away the full production of the mines, and some idle time resulted. Because of this many of the workmen sought more steady work elsewhere, and this has still further reduced the output capacity.

The awkwardness of the situation so far as it affects the Dominion Coal Company and its workmen is well explained in a resolution passed by the members of the Provincial Workmen's Association and forwarded to the Premier of Canada, the text of which is appended to these notes. This resolution does not, however, cover the serious situation which faces the coal consumer in Montreal and other cities of Eastern Canada and Newfoundland which look to the mines of the Dominion Coal Company for their winter coal stocks. If the shipments of coal from Cape Breton to St. Lawrence ports exceed one-quarter of the normal seasonal tonnage things will have to improve very considerably both in the matter of outputs and of ships to carry the coal to market. The production of the two companies operating in the Joggins field is again worthy of note, the Maritime Coal & Railway Company showing one of the largest percentage increases in the Province. The Inverness Company shows an encouraging increase. The International Coal Company's production has been much decreased by the fire that occurred in November last, which has compelled this Company to abandon its workings in the Drummond Main Seam. Good progress is being made in development of other seams underlying, and larger outputs should be obtained during the last half of the year than have been found possible during the first half.

The Acadia Coal Company has returned almost to the production it had before the explosion in the Allan Shafts. Some coal was lost by a hasty and rather foolish strike on the part of the workmen of this Company. The Nova Scotia Coal & Steel Company also shows an increase, but its production is still very considerably behind the figures of 1914.

The fairly general increases shown in the production of the smaller companies, particularly the small mainland collieries, are a result of the demand for coal, and there is no doubt the increases would be much larger were it not for the shortage of miners. Yet these numerous individual increases, encouraging as they doubtless are to the companies to whose credit they stand, are wiped out and more than nullified by the decrease in the production of the Dominion Coal Company.

A factor that is causing much loss of output is the grave percentage of absenteeism among the mine workmen. After the example which the miners of Nova Scotia have set in the matter of enlistment no one will dare to accuse these men of non-appreciation of the needs of the Empire. They have responded in a manner which will always redound to their honor, but there must be a good many men among those who remain behind who do not realise the miner's part in this fight. It may be safely said the man who digs coal today is doing his bit just as effectually as the soldier who stands in the trenches. Yet when after pay day the production of coal falls down by four and five thousand tons from the previous day's figure it is evident many miners have not grasped the part they are called upon to play today.

Three things have been made the subject of government enquiry in Great Britain and in France also, namely the restriction of enlistment among mine-workers, the reduction of absenteeism, and control of the sale of liquor. Each of these matters possesses proportionate importance in Canada. So far as the mining districts in Nova Scotia are concerned liquor is supposed to be thoroughly controlled. Indeed its sale is prohibited, and there are numerous paid officials whose sole business it is to seek out and prosecute offenders against the prohibition law. Yet probably never in the history of the Province was more liquor vended in the mining and munitions districts of Nova Scotia than today. And such liquor! It is described by one colliery manager as a mixture of "snakes, brains and lightning," and two drinks will set a man crazy.

Following is copy of a resolution dated May 29:

At a special meeting of this Lodge of the Provincial Workmen's Association of Nova Scotia the following resolution was unanimously adopted, namely:—Whereas the Admiralty has requisitioned a large proportion of the chartered shipping tonnage of the Dominion Coal Company, with the following results, to wit:

Reduction of the coal shipments to the St Lawrence ports by two-thirds, causing loss of this market to the Dominion Coal Company.

Large stocks of coal banked at the mines, with the double object of giving work to the employees of the Dominion Coal Company during the past winter months, and of providing against the customary shipments to the St Lawrence upon the opening of navigation, must remain on the ground, with the risk of the banks taking fire. If the limited shipping available is utilised to transport the bank coal, then the collieries must remain idle, which will result in distress among the work-people through idleness and inability to earn daily wages.

The sale of American coal in the Montreal and St Lawrence market on a large scale will displace Nova Scotian coal and permanently injure a market that has been obtained by dint of many years of strenuous competition with United States coal, and will inevitably affect adversely the future employment of the miners here.

Therefore the Provincial Workmen's Association, representing the mine employees of the Dominion Coal Company, seeing their livelihood imperilled, petition the Government of Canada to obtain from the Admiralty the release of sufficient of the chartered vessels of the Dominion Coal Company, now under requisition, to enable the Company to market the coal produced, and thereby avoid idleness at the mines, with resultant distress among our members during the coming summer and winter.

We respectfully draw the attention of the Government to the following facts:

The miners of the Dominion Coal Company have enlisted to the extent of 25 per cent of the total employees of the Company. The production of coal has thereby been decreased by over 100,000 tons monthly at the present time.

The Dominion Coal Company cannot replace the vessels that have been requisitioned by other vessels chartered at current market rates, because the contracts of the Company are for delivered coal, the price at the point of delivery being in many cases less than the cost of freighting alone, at present rate of ship-hire.

The members of this Association are convinced that investigation of the production of coal in Nova Scotia would show a decrease of an alarming nature, shortly to become even more pronounced. The miners consider that seeing the enlistment from among their ranks has exceeded that of any other trade in the Dominion of Canada, the production and the earnings of those who remain behind at work, should not be further imperilled.

We therefore request the Canadian Government to use the most strenuous representations to obtain the release of sufficient of the chartered vessels of the Dominion Coal Company to relieve the present most serious situation.

## ATHAPAPUSKOW.

The Pas, June 23.—Kenneth Miller and Henry Borth came into town late last month from Athapapuskow lake, bringing samples of ore taken from claims staked by them in that locality. Miller has been prospecting in that locality for eighteen months, and has kept very quiet about his discovery. Borth fell in with Miller only a short time back, and the latter told him of the discovery. Both men came to town, and Borth proceeded to Winnipeg with the samples. Miller received a report of the assay from Milton Hersey Company, Winnipeg, on Monday last, which states the samples showed values in copper, silver and gold slightly over $16 to the ton.

The vein on the Miller-Borth claim has been stripped to a width of 15 feet, and the hanging wall has not as yet been reached.

The claims are located some eight miles east of the Tonopah properties, near the mouth of Pineroot river. About one mile north of the Miller claims a discovery was made last fall, samples of which assayed over $20 in copper. Miller said he had no doubt his find will equal in value anything yet found in the northland. He went back north on Tuesday by the Ross boat, and will continue development work throughout the summer months.—The Pas Herald.

## WEST SHINING TREE.

Some very rich ore has been uncovered recently on the claims in MacMurchy township now being developed by Mr. A. M. Bilsky and associates. Samples brought to Toronto last week show abundant free gold in a quartz gangue.

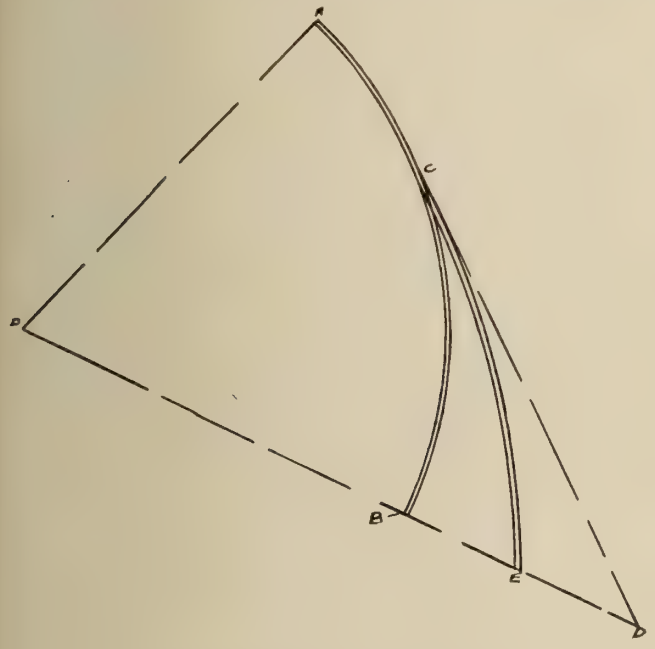
The property being developed by the Bilsky syndicate, of which Mr. Mark Workman, president of the Dominion Steel Co., is a member, was formerly known as the Jefferson claims. Mr. Bilsky reports that there are many promising properties in the neighborhood lying idle owing to lack of capital.

# DESIGN FOR A GATE FRONT

By Albert E. Hall.

All those who have used chute gates of the arc type with the convex side of the gate toward the muck have no doubt experienced trouble with the opening of the gate. Where the gate is air operated it is often necessary to work the gate several times before it will finally permit the flow of muck. Where the gate is hand operated in addition to using the gate lever it is sometimes necessary to use a bar under the gate itself to start it opening. The cause of this is the weight of the muck against the gate and in the ordinary gate there is at the point "B" in the diagram a small space where the muck if it be fine can pack under the gate and make the operation very hard. For these reasons the front of the gate has been changed in some of the western mines in the following way and this change has made a big improvement.

If in the diagram the front of the old gate be the arc "ACB" it is changed as follows: At a point two-thirds the way up the gate front at the point "C" a tangent is drawn which will intersect the prolongation of the old gate radius "OB" at the point "D." Bisect the line "BD" which will give us the point "E." Draw in the arc "CE" and the arc "ACE" will be the new line of the gate front. A gate front designed on this principle has been operated very successfully out west and has been applied in other districts with equally good results.




**Sketch Showing Gate Front.**

AB: arc of old gate.

O: fulcrum of old gate.

C: point ⅔ of arc AB from B.

CD: tangent to AB at C.

BD: prolongation of OB.

E: middle of BD.

AE: arc of new gate.

# U. S. GOLD AND SILVER IN 1916

The precious-metal mining industries of the United Stated continued active during the first six months of 1916, practically all important mines and mills operating at full capacity, according to a statement just issued by the United States Geological Survey. Shortage of cyanide supplies, feared in 1915, was obviated by increased output of domestic sodium cyanide, which has practically replaced potassium cyanide in the leaching of precious metals. Flotation has begun to increase saving of gold from tailings. There may have been some decrease in gold prospecting during the last eight or ten months, as many old gold prospectors have been giving attention to deposits of tungsten, antimony, quicksilver, and other mineral products whose value has enhanced since the outbreak of the war. There was also some labor shortage at mines and mills owing to high wages paid in factories making war supplies.

Final figures of the Geological Survey and the Bureau of the Mint give a total domestic production for 1915 of $101,035,700 in gold, and 74,961,075 ounces of silver, valued at $37,397,300, against $94,531,800 in gold and 72,455,100 ounces of silver in 1914. These figures include the gold production of the Philippines, which has been steadily on the increase.

The total output both of gold and silver reported for 1915 was the highest ever recorded under the American flag, but if the Philippine output be eliminated the production of gold in the United States proper was but little above the previous record year of 1909. The output of silver for 1915 was materially above the preceding record yield of 1914. For 1916, from the mid-year point of view, the outpoint of gold which is apparently falling off somewhat compared with 1915, in Colorado, California, Nevada and some other States and increasing possibly in Arizona Oregon, the Philippines, Idaho, Montana, New Mexico, and elsewhere, will probably reach a total somewhat below the high output of 1915. The production of silver, however, will undoubtedly again break all previous records, as the output of silver ores and of the copper, lead and zinc ores which produce silver in notable quantities will exceed that of any preceding year, owing to steady demand and high prices for all metals.

Prices of silver were low in the greater part of 1915. The monthly average commercial price at New York which rose to about 52 cents an ounce in November, however, reached 55 cents in December, and climbed steadily to over 74 cents in May, 1916, but fell to about 65 cents in June. The sharp increase in prices resulted from strong demand for the Far East at the end of 1915 and abnormally large requirements by the belligerent countries for coinage for the troops in the field. These demands found available stocks low, largely because of the great falling off in the Mexican output due to the long continued disturbance there. With the consequent inevitable rise in prices domestic producers of silver profited greatly, notwithstanding the increased cost of labor and of mining supplies. Silver is in demand not only for coinage but also for sterling and other silver wares, as well as for drugs and chemicals. The manufacture of silver sals used in photography, particularly in films for hand cameras and cinematographs, has vastly increased in recent years. The mid-year outlook indicates continued demand for silver, the metal last to benefit by the general domestic prosperity.

# UTILIZATION OF ZINC

Zinc is a bluish-white metal, brittle at ordinary temperatures, and having a crystalline fracture when pure. It melts at 420 deg. C. and boils at 930 deg. C.; at a temperature of about 200 deg. C. it can be readily powdered, but at temperatures between 100 and 150 deg. C. it may be rolled or drawn, after which treatment it retains its malleability on cooling. The presence of a small percentage of lead, which is so objectionable in the manufacture of brass, is of considerable assistance in rolling. Zinc tarnishes superficially in moist air.

In the following an account is given of the more important uses of metallic zinc. Many of the compounds of zinc, such as the oxide, chloride, sulphate and carbonate, are employed for a great variety of medicinal and industrial purposes; but in the present article the utilization of such compounds is only considered with reference to the preparation of pigments.

### Spelter.

Galvanizing is the most important use to which metallic zinc is put, probably consuming nearly 80 per cent. of the total output. The process, which was discovered in 1837, consists in depositing a very thin coat of the metal on iron in order to protect the latter from oxidation by the atmosphere. It is stated that this zinc coating exerts a greater protective action than tin-plating.

In the process of galvanizing, the iron is freed from scale by immersing it in hydrochloric acid contained in stoneware troughs. The strength of the acid and time of immersion ("pickling") vary with the nature of the work and the cost of the acid. In the United Kingdom iron sheets are pickled in a 20 per cent. solution of hydrochloric acid, and sometimes undiluted "muriatic acid," which contains from 26 to 30 per cent. of hydrochloric acid, is employed.

Iron wire and tubes are treated with acid of 12 per cent. strength. Using acid of any of the strengths mentioned above, the operation is complete in a few minutes; but on the Continent, where a weaker acid is used for reasons of economy, it is necessary to immerse the articles for several hours, and also to warm the bath slightly. At some works dilute sulphuric acid is used in place of hydrochloric acid.

After pickling, the plates, etc., are well washed, scoured with sand, and immersed in the galvanizing bath, which is contained in a wrought-iron pot, and consists of molten zinc covered with a layer of ammonium chloride. From 2 to 3 per cent. of tin is sometimes added to the bath when it is desired that the finished goods shall have a spangled appearance. Corrugated sheets are often galvanized plain and then passed through the corrugating machine.

The consumption of zinc varies largely with the nature of the article treated, thin wire requiring up to 25 per cent. of its own weight.

The process yields two important by-products: (1) "hard zinc," (2) flux skimmings. The first mentioned is an alloy of zinc and iron, containing from 2 to 5 per cent. of the latter. Flux skimmings consist of chloride and oxide of zinc, together with some ammonium chloride.

The disposal of the waste pickling liquors, which contain about 15 per cent. of hydrochloric acid and 10 per cent. of iron, chiefly as ferrous chloride, has caused considerable trouble in many localities, and special processes have been devised to deal with the matter.

Sherardizing is the name applied to a special method of galvanizing. The cleaned articles are heated to a temperature just below the melting point of zinc in a closed receptacle containing zinc dust. The volatilized zinc slowly combines with the iron, giving a coherent protective coating. The process is specially adapted for coating articles having a pattern or design on the surface which would become filled up and obliterated if the ordinary galvanizing process were employed.

Electro-galvanizing is sometimes employed for special purposes. In this case the zinc is either in the form of a neutral solution of the sulphate or dissolved in excess of caustic soda.

Spelter is largely used for the production of "slush" castings for ornamental purposes. In these, the metal is poured back into the ladle as soon as a thin layer of metal has solidified. These hollow castings must be sound, as they are usually required to be subsequently plated. Both lead and cadmium are stated to have detrimental effects in this connection.

Amongst other important uses of spelter must be mentioned its employment in the desilverization of lead. Zinc very readily combines with gold and silver, and the alloy formed can be easily separated from molten lead.

In the Parkes process, the zinc in slabs is stirred into the molten lead, and the alloy of gold, silver, copper and zinc, which rises to the top, is skimmed off. Three or four treatments with zinc are usually sufficient to remove all the silver from the lead except 0.1 oz. per ton. The consumption of zinc varies according to the content of silver; thus, lead containing silver 0.1 per cent. requires 1.4 per cent. of zinc, whilst if 1.0 per cent. silver is present, only 2.5 per cent. of zinc is required. The skimmings are distilled so that a large proportion of the zinc is recovered, whilst the precious metals remain in the non-volatile portion. It is essential that fairly high grade zinc be used for this purpose, as certain impurities, particularly iron, cause a much larger consumption of zinc.

Another use which consumes a large quantity of zinc is that of precipitating gold from cyanide solutions by means of zinc shavings. From 5 oz. to 1 lb. of the metal is used for each ounce of gold recovered. The consumption of zinc in South Africa, chiefly for this purpose, amounted to 4,867 tons in 1914.

### Zinc Dust.

When zinc vapor is cooled too rapidly after distillation, or if it becomes too largely diluted with other gases, a bluish-colored impalable powder results. Some of this substance, which is known as "zinc dust," or "blue powder," is always formed during the process of distillation, the amount varying from 3 to 10 per cent. of the total zinc present, when retort smelting is used. With electrothermic processes the quantity may be still larger. This powder, which consists of metallic zinc and 8 to 15 per cent. of zinc oxide, cannot be made to coalesce by ordinary means, and if it is desired to recover the zinc in a coherent form, i.e., as spelter, the powder must be re-distilled. Zinc dust is usually found in the "prolongs" beyond the condensers. There is a limited market for the product, and the commercial standard is that it shall pass a 100-mesh sieve and contain not more than 10 per cent. of zinc oxide.

*Extracts from an article published in the Bulletin of the Imperial Institute, London, March, 1916.

Zinc dust is considerably more active chemically than spelter, being subject to more rapid oxidation, and having the power to absorb hydrogen. On this account it finds many uses in chemical industries, being used to discharge locally the color of dyed cotton goods, and in the preparation of synthetic indigo. It has also been used for the recovery of gold from cyanide solutions of the metal, for which purpose it has been stated to be more efficient than zinc shavings.

### Zinc Alloys.

Zinc enters into the composition of a number of alloys of considerable industrial importance, such as brass, German silver and antifriction metal.

Zinc and copper alloy in all proportions, the resultant products being of uniform composition throughout, as the metals do not segregate. The addition of small quantities of zinc to copper renders it "red short," that is, incapable of being worked when red hot, but has no appreciable effect on the malleability of the metal when cold. Alloys containing over 80 per cent. of copper are red or reddish-yellow in color. Brass containing 60 per cent. of copper can be rolled hot or cold, but it is less ductile than the alloys containing a larger percentage of copper, although its tensile strength is greater. The alloys containing over 50 per cent. of copper are chiefly employed as "brazing" or "hard" solder. Muntz metal was originally introduced for sheathing wooden ships, but is now chiefly used, under the name of "yellow metal," for the cheaper varieties of brass tube, wire and sheet. When the quantity of copper is reduced to 50 per cent. the resultant zinc alloy cannot be rolled either hot or cold, and as the amount of copper is further decreased the alloys become more fusible, brittle and nearly white in color.

German silver, which is also known under the names of "nickel silver," "electrum" and "white copper," is an alloy containing copper 50 to 60 per cent., zinc 14 to 30 per cent., and the remainder nickel. It is almost white in color, practically unaffected by air, and can be rolled, spun or cast; for the last purpose, however, a small quantity of lead is often added.

The addition of a small quantity of zinc to certain alloys increases their wearing power, and for this reason it is added to bearing metals and to the bronze coinage, which contains about 1 per cent.

The approximate composition of various zinc alloys is shown in the following table:

| | Zinc. Zn. p.c. | Copper. Cu. p.c. | Tin. Sn. p.c. | Antimony. Sb. p.c. | Nickel. Ni. p.c. |
|---|---|---|---|---|---|
| Antifriction metal .... | 85 | 5 | .. | 10 | .. |
| Foundry pattern metal . | 75 | .. | 25 | .. | .. |
| Brazing solder ..... | 50 | 50 | .. | .. | .. |
| Delta metal* ..... | 43 | 55 | .. | .. | .. |
| Muntz metal ..... | 40 | 60 | .. | .. | .. |
| Stereo metal* ..... | 38 | 60 | .. | .. | .. |
| Naval brass ..... | 37 | 62 | 1 | .. | .. |
| Ordinary brass ..... | 33 | 67 | .. | .. | .. |
| Yellow brass ..... | 30 | 70 | .. | .. | .. |
| White metal ..... | 22 | 54 | .. | .. | 24 |
| German silver ..... | 20 | 50 | .. | .. | 30 |

*Also contains 1 to 2 per cent. of iron.

As already mentioned, zinc readily alloys with silver and gold, and this property is utilized in the separation of the latter metals from metallic lead.

### Zinc Pigments.

The most important zinc pigments are zinc oxide, or "zinc white," and lithopone; zinc-lead oxide and leaded zinc oxide are of less importance.

Zinc white is prepared by a number of methods which may be roughly grouped into those involving production from (a) spelter, (b) the ore, without intermediate separation of the metal.

In the Silesian method, the spelter is heated to its boling point in retorts, and the vaporized metal allowed to burn in air to zinc oxide. As the crude spelter always contains some lead, which in this process would be converted to oxide and impart a yellowish tint to the zinc white, a small quantity of gas containing carbon dioxide is introduced into the retort. The lead is thus converted to carbonate, which is considerably heavier than the zinc white, and therefore settles first in the condensers.

In Belgium the pigment is also made by burning spelter, but the final product is purified by levigation. The spelter used in Belgium contains up to 2 per cent. of lead, and 0.01 to 0.04 per cent. of iron, and the zinc white contains lead 0.002 to 0.2 per cent., iron 0.003 to 0.005 per cent., zinc oxide 99.69 to 99.99 per cent.

It has been claimed that zinc white made direct from the ore is a more durable pigment than that obtained by burning spelter.

One of the best known direct methods is the Wetherill process, which is largely used in the United States. In this process, the oxidized ore is mixed with the quantity of anthracite necessary for its reduction, and then spread upon a bed of anthracite, which is burned on a perforated grate by means of an underdraught. The metal thus produced is volatilized and oxidized by the products of combustion, and the oxide finally drawn away into the flues and collected in muslin bags.

Lithopone is much used as a pigment and filler for rubber goods, linoleum, enamel paints and table oilcloth. It consists of a mixture of zinc sulphide and barium sulphate. As in the case of other white pigments, purity of raw materials is essential, iron compounds being very objectionable. It can be prepared by mixing solutions containing equivalent quantities of barium sulphide and zinc, sulphate about 0.5 to 1.0 per cent. of a mixture of freshly prepared magnesia and common salt being added to the mixture before filtration. The precipitate is collected in a filter press, dried, mixed with 3 per cent. of ammonium chloride, and the whole heated to dull redness. Lithopone darkens when exposed to sunlight, and it is therefore desirable to combine it with other pigments when it is to be used for outside work.

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## KOWKASH.

A promising discovery was made on June 23 on the Robert Wells claims, 1½ miles southeast of Tashota Station. According to Mr. P. E. Hopkins, who is making a geological map of the area for the Ontario Bureau of Mines, the discovery is an auriferous quartz vein, 2 to 3 ft. wide, which has been traced for 25 ft. It is on claim P.B. 2892, about ¼ mile south of the railway.

There are about 100 prospectors in the district. No work is being done at the Dodds' claims at present, but it is said that work will be resumed there shortly.

# PROGRESS IN UNDERGROUND ORE LOADING*

By M. E. Richards

The desire to lower mining costs, coupled of late years in some cases with a scarcity of labor, has fixed the attention of mining men upon mining machinery as one of the import ant means to greater efficiency. Notable advancement has already been made in this field, and the needs of the day are keeping mining men constantly on the alert for still greater progress. Every machine used in mining has been improved, and a special effort has been made to substitute power operation for hand labor. This is particularly true of drilling in mines. The efficiency of drilling machines has been increased so that a greatly increased amount of ground can be broken by one man in an hour; but there is still a great amount of time and money spent in shoveling or mucking, especially at the present time in connection with drifting and tunnelling operations. After the rock and ore is broken, with but a few exceptions, mine operators are still using ancient methods of loading ore by hand methods, which were used over two thousand years ago. Many attempts have been made to eliminate this mucking by hand, which incidentally is the hardest manual labor underground, and several machines have been tried for this purpose. Nearly all of them have failed, however.

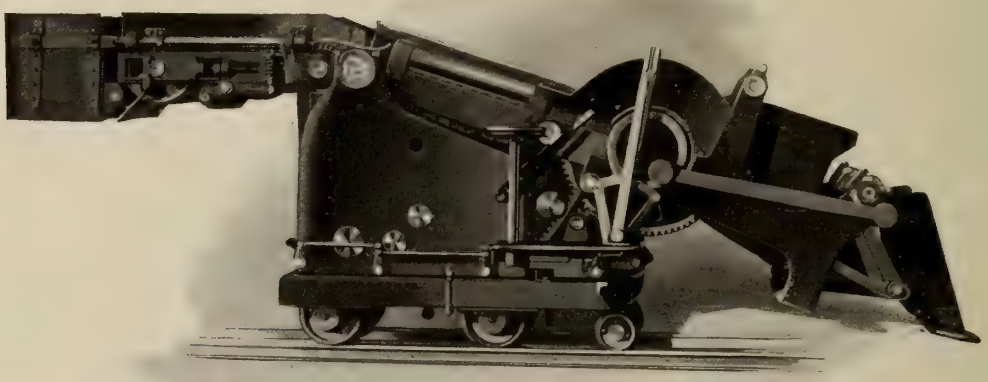
It must be able to handle sticky ore, wet ore, dry ore, chunks weighing from 60 to 100 pounds, and even the larger pieces occasionally encountered. All machinery and working parts must be completely housed and protected from dirt and water.

The motion of the machine must be such that, if a wall or big chunk of ore or other firm objects are struck, the mechanism will not be damaged. It must be able to shovel, convey and dump broken materials.

It must be so designed as to permit of its use in drifts 6 ft. by 6 ft., and at the same time so that it can be taken down through a shaft and through openings considerably smaller. It must also be easy to move to and from the breast of the drift, on its own power if necessary.

To combine all of the above in one machine is no doubt difficult, but actual observation of the several machines now on the market indicates that it has been already accomplished.

Realizing the need for a mechanical shovel that will work underground, urged on by predictions of a labor shortage, individuals in almost every mine organization set their minds to work and evolved ideas for, and in many cases actually set to working out, a practical machine. Such



**HALBY SHOVELING MACHINE**

The efficiency engineers are at present making time studies of the operations in mucking; there have been careful investigations of late of the advantage of long and short handled shovels; a relay shoveling system has been worked out and applied; car bodies have been lowered to reduce the effort of loading and all of these activities and improvements are bound to produce results. However, after all, it is the mechanical shovel to which we must look for the final solution of the problem. When this comes, the system which has seen no change since mining began, if not completely revolutionized, will at least be greatly improved.

To be successful a mechanical shovel must satisfy the following requirements:

The first cost must be reasonable; there must be no doubt that the investment will yield a good return. This also means that the machine must have sufficient capacity to do the work of several muckers.

The machine must be simple, durable and not liable to break down, and all parts must be readily accessible for removal, adjustment and replacement. It must be a machine which can be handled by miners or handy men, easily guided and controlled, and which is as near foolproof as possible.

activity has not been confined to recent years, for I find on investigation that already about twenty years ago, a conveyor-type loader was tried out at the Fayal mine of the Minnesota Iron Mining Company.

About ten years ago Thompson & Greer tried out a machine of their own design of the conveyor-type at the Newport property. The machine showed some saving in operations, but was out of order a large part of the time.

About four years ago Mr. Nels Flodin of Marquette, started with a drag shovel, the special feature of which was a small drum which pulled an ordinary drag scraper, fastened to a rope, up an incline and dumped it automatically into a car. The scraper had to be pulled back by hand; it was this feature of its operation which probably caused the machine to be abandoned.

During the present year The Cleveland-Cliffs Iron Company has worked out and is using a conveyor-type loader at the North Lake property. It is considered a success and has demonstrated itself to be a labor saver and it has considerably increased the speed in drifting. The output has been increased from 25 to 30 per cent. The arrangement is simple: Men shovel by hand onto the belt of a belt-conveyor, which runs up an incline and discharges into a tram car.

*From a paper read at the 20th Annual Meeting of the Lake Superior Mining Institute, held on the Gogebric and Cuyuna Ranges, Sept. 6-9, 1916.

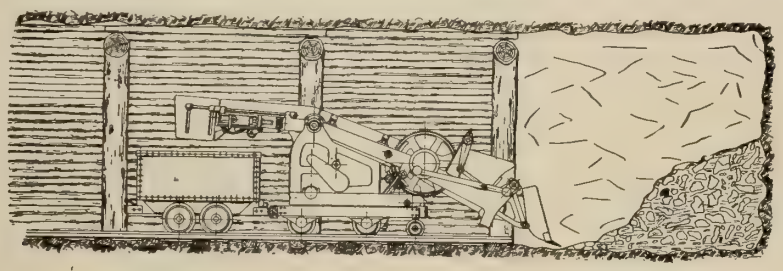
During the present year there has been a loading machine in daily operation in the Morton mine on the Mesaba Range, and it has been giving satisfactory results. It was designed by Billings and Middlemiss of the Morton mine. This machine consists in general of a large hoe which reaches out and drags ore onto an apron, which in turn discharges it onto a belt-conveyor which elevates it into the ore car. The original idea was to adopt the three motions of a steam shovel to a machine for drift use, and this machine has been built around that idea. It consists essentially of three air cylinders; one operating the in-and-out motion of the hoe; one the swinging motion, and the third the tilting motion. A reciprocating air engine drives the conveyor and propelling mechanism. One man can run the loader and operate the hoe; another swings and tilts the conveyor and propelling mechanism from the operator's stand. Some very good results in cleaning up a breast of thirty tons of ore have been obtained, the time required in wet dirt averaging two hours; in dry places this amount of ore has been taken out in an hour.

Another type of loading machine has been worked out by Mr. Sam Hoar of Virginia, Minnesota. Considerable experimental work is being done with this machine, but to my knowledge it has not yet been tried out in practical service. This machine employs an air cylinder which runs a shovel out on a beam, takes a load and drags it back onto the conveyor, which discharges into an ore car.

The machine as marketed to-day has an overall length of 15ft., but it can in a very short time be shortened to an overall length of 10 ft., if conditions necessitate the shorter length. It can be arranged to any gage from 18 in. up to 44, and is designed for operation on curves of 25 and possibly 20 ft. radius. The overall height of the machine is 5 ft. 4 in., and the total width approximately 4 feet. Its total weight is nine thousand pounds.

The machine is arranged for air, gasolene, or electric operation, and requires one man to run it. It is made up in three distinct sections, each of which forms a unit by itself; permiting the machine to be taken down very small shafts. The top or conveyor section contains the working parts for the conveyor and shovel mechanism. The centre or power section contains the motor power, clutches and gear drives. The lower or truck section is the travelling support of the entire machine.

The motion of the Halby shoveling machine corresponds very closely to the motion of a hand mucker with a shovel. A shovel 22 in. wide is actuated by a lever, which gives it a forward movement when at the bottom of its travel. The machine itself in being propelled forward furnishes the power which thrusts the shovel into the pile. To withdraw the shovel, the machine is moved backward; but this is unnecessary, for the shovel will lift itself. When lifted, it takes an incline position at an angle of about 65°, delivering the load onto the conveyor belt which is running



The McDermott machine is another type. This, too, is still being worked on at the present time, and to my knowledge is not at present in actual service. This machine as originally conceived, as I understand it, was built around the steam shovel idea with many modifications to fit underground conditions.

There are two machines on the market to-day which are being used in actual mining work. The older of the two is the Meyers-Whaley machine, which is manufactured and used considerably in the south. This machine has been doing very efficient work, cutting down loading costs to a great extent, and is a great labor saver. On the front end of this machine there is a shovel with automatic cam motion, which discharges the ore onto the bottom of the belt conveyor which elevates the ore and discharges it in the rear into a car. The power used for this machine is either electric or compressed air. I understand that this machine is approximately 24 ft. long and weighs about 8½ tons. Its length would probably prevent its general use in the Lake Superior iron ore mines, as it could not be readily moved around our sharp curves and small openings without being dismantled. There is no doubt, however, that under conditions where this machine can be used, it will greatly reduce the cost of drifting and mucking; in fact, this has been proved in the case of the many machines which have been turned out by the Meyers-Whaley Company.

The latest development in a mechanical shovel is the machine known as the Halby shoveling machine, manufactured by the Lake Shore Engine Works of Marquette, Michigan. This machine was first conceived about three years ago, and the first completed machine was shown on the Marquette Range last year.

continuously and which carries the ore over the machine and back into the ore car. An automatic deflector delivers the ore into the centre of the car, irrespective of the position of the shovel in the face of the drift.

One man operates the machine by means of levers on a platform placed at the side of the machine. The dipper runs automatically, thrusting into a bank of ore, raising the load up and discharging out of the back of the dipper onto the bottom end of the conveyor-belt, as described above. The shovel runner merely controls the propelling motion of the machine to keep it well up against the bank or swings the shovel from one side of the drift to the other as the pile is loaded, or raises or lowers the beam which holds the dipper, so that it will dig at any elevation required. There are four levers on the platform, two of which are used continuously.

The Halby shoveling machine has been tried out during the present year at the Judson mine on the Menominee Range, and the results have been very satisfactory. The cost of drifting has been reduced to a considerable extent, and it has been found that one man with this machine can do, in the same time, the work which it takes 12 men with shovels to do. This machine is at present loading a 35 cu. ft. car (two tons), in an 8-by 8-ft. drift, in 1½ min. when loading conditions are fair, that is, when there is a fair sized bank of ore in front of the machine. At times the ore bank is smaller and scattered, and under such conditions it takes as high as 4 min. to load a two-ton car. Formerly with hand labor it required 2 men shoveling 20 min. to load a two-ton car under the same conditions that the machine is now working.

The cost of operating the machine an 8-hour shift has been estimated as follows:

| | |
|---|---|
| Power | $3.00 |
| Runner | 2.50 |
| Interest on Investment | .40 |
| Repairs | .50 |
| Oils, etc. | .17 |
| Total | $6.57 |

Figuring 200 tons loaded per 8-hour shift, this is a net cost per ton of .032c with the machine. The labor expense of two men loading by hand for an 8-hour shift would be $5.10. Under similar conditions they would load approximately 30 tons in 8 hours at a cost of 17c per ton.

The experience at the Judson mine has very clearly demonstrated that a mechanical shovel will not only considerably reduce the mucking cost, but will also enable a much more rapid advancement in drifting. I do not desire to give the impression that a mechanical shovel can be used to advantage in mining under all conditions, for this would not be true. These machines would not reduce the cost where the ore is milled down from stopes, and it is not necessary to shovel, as in back-, sub- and block-stoping; but in these mines it can be used to great advantage in development work, by reducing the cost per foot in drifting and by speeding up the development work. A mechanical shoveling machine can be worked to advantage in practically every place where the hand shovel is used in drifting, trenching and developing, and in the slicing and caving system of mining, and in all classes of mining where it is necessary that the ore be shoveled, and in all openings in which the machine will operate.

## NO CANADIAN NICKEL FOR GERMANY.

Toronto, July 11.—"There is absolutely no chance of any Canadian nickel getting to Germany either by the Deutschland or in any other way," was the emphatic statement of Hon. G. Howard Ferguson to the "Mail and Empire" last night when referred to the report that the big German undersea boat was to take back nickel in her cargo. "By the arrangement with the International Nickel Company not a pound of nickel can go to Germany, and the best assurance we have that Germany is not getting nickel is the fact that the Imperial authorities are quite satisfied with the condition of affairs.

"The newspaper man—I need not name him—who seeks to give a different impression has committed a grave wrong against the peace of mind of the people, and has done a great deal to hurt recruiting when he says we are furnishing the material to Germany to shoot our own boys. He must know the statement is not true. He knows perfectly, or he should know, of the arrangement with the Imperial Government through the Dominion, with which the Imperial Government is entirely satisfied."

Hon. Mr. Ferguson declared that it would be impossible for Germany to get Canadian nickel even by indirect means. The British through their secret service could trace the destination of every pound of nickel sold in the United States. The Minister stated that there were sources outside of the Canadian mines from which Germany could get some nickel, if she could get it across. There was annually available about 700 to 1,000 tons of nickel as a by-product of the copper mines, and it was known that a considerable amount of this had been accumulated by German interests in the States to await an opportunity to ship it.

Commenting upon the proposals for nickel refining in Ontario, Mr. Ferguson stated that he had every confidence that as a result of the investigations now being carried on by the Nickel Commission, nickel refining in Ontario would become commercially successful.





COPPER INGOTS AT A MICHIGAN SMELTER

In the July bulletin of the Canadian Mining Institute Mr. David H. Browne and Mr. Gilbert Rigg, draw attention to some valuable lessons of the war. They urge that every effort should be made to utilize in peace times what has been emphasized in war, namely, our ability of doing greater things when we get together with a common purpose.

The article, written by Mr. Browne and based on a conversation with Mr. Rigg, deals with men rather than with methods, and is consequently unusually interesting. Elsewhere in this issue we reprint part of it, and commend it to our readers as a thoughtful article conveying ideas well worthy of careful consideration.

The annual report of Mr. A. A. Cole, mining engineer of the Timiskaming and Northern Ontario Railway Commission, has just been issued. Mr. Cole's reports are authoritative records of mining development in the area served by the Ontario Government Railway. Through Mr. Cole the Railway Commission is kept in close touch with the mining industry, a condition which results in better service for the industry and increased business for the railway.

## HEINZE APPEAL IS DISMISSED.

Messrs. Gard, Lyell & Co., the legal representatives of the province in London, recently cabled the Premier of British Columbia to the effect that the Heinze petition had been dismissed with costs. This finally disposes of a cause celebre arising from the matter of the taxation of the Columbia & Western Railway lands.

This decision of the Privy Council is of extreme importance in respect to its bearing upon the revenue of the province.

Under the Railway Subsidies Act of 1896, the late F. Augustus Heinze secured a grant of land for the Columbia & Western Railway. In 1898 he sold out to the Canadian Pacific Railway, but retained an individual half-interest in certain blocks of land, amounting to 600,000 acres, it being stipulated that he was to have these lands when he wanted them. The lands he was to receive were taxable in a certain period of time, or when he took his share they would become taxable. If they remained as originally granted to the Columbia & Western, they would become taxable two or three years after the sale to the Canadian Pacific Railway Co.

The Canadian Pacific Railway Co. repeatedly urged upon Mr. Heinze that he should make choice of his share, as they wished to administer the lands. Mr. Heinze declined this invitation and the Canadian Pacific Railway Co. brought action to force him to take his lands.

### Lands Become Taxable.

Then, by the effluxion of time, under the terms of the Railway Aid Act of 1896, the lands became taxable; but prior to this period the Canadian Pacific Railway Co. had sold out its holdings to the government.

After the purchase by the government from the Canadian Pacific Railway Co. in 1912, the Columbia & Western lands became liable to taxation. But as Mr. Heinze had never placed any lands in his name, they became registered in the Crown, including Mr. Heinze's one-half interest.

The situation was thus very much complicated, as the government could neither sell nor tax, as they were Crown lands. So, in 1913, the attorney-general of British Columbia brought down an amendment to the Taxation Act, giving the government power to tax and sell lands in such position, without naming Mr. Heinze.

The government thereupon proceeded to assess Mr. Heinze's interest in the lands, which it had title of, and in July, 1914, there was appointed a judge of the court of revision to hear an appeal by Mr. Heinze and on the case being heard judgment was given in favor of the Crown.

Mr. Heinze next appealed to the court of appeal at Victoria, and on July 14th, 1914, Mr. Justice Martin delivered the unanimous judgment dismissing the appeal. Mr. Heinze then appealed to the supreme court of Canada, and Mr. Le Fluer, of Montreal, one of the most brilliant lawyers of the Dominion, appeared for the attorney-general of British Columbia, and on May 4th last judgment was given dismissing the appeal.

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## FELDSPAR MINE SOLD.

The Richardson feldspar mine, Frontenac Co., Ont., has been purchased by Mr. S. Harry Worth, owner of feldspar mills in New York State. Mr. Worth is president of Seneca-Superior Silver Mines, Ltd. Mr. W. E. Segsworth, one of the chief owners of Seneca-Superior, and consulting engineer for that company, is managing Mr. Worth's feldspar properties.

## BOOK REVIEWS.

**Practical Geology and Mineralogy, by W. D. Hamman. Published by Way Press, South Pasadena, Calif., 1915.**

This is a revised edition of a book which is written with a view to use by those who lack scientific training, but desire to learn something about the elementary principles of geology and mineralogy. The author has used simple language and has avoided technical terms and expressions which would confuse the non-technical reader.

**ELEMENTS OF MINERALOGY, by Frank Rutley, revised by H. H. Reid, published by Thomas Murby & Co., London, E. C. Price 3/6. For sale by Book Department Canadian Mining Journal.**

This is a new and thoroughly revised edition of Rutley's little book. While much of the original has been conserved, many changes have been made in an endeavor to make the book more useful in determining minerals and assisting the prospector.

Mr. Geo. T. Holloway, chairman of the Ontario Nickel Commission, has written a very interesting introduction, bringing out the business aspect of mineralogy which he says has until recently been almost ignored in colleges and teaching institutions throughout the world. Mr. Holloway says further: "The broad geological aspect of the occurrence and association of minerals can only be gained in the field. . . . A training in economic mineralogy suitable for mining men, among whom, of course, is included the prospector, and with whom is commonly included, although probably wrongly, the ore dresser, can, however, be very efficiently given in our colleges and is one of the most essential, although most neglected parts of a mining man's education. From this point of view, as well as from that of the metallurgist, the training should include, not merely the identification and determination of the nature of the individual minerals which are associated together, but their general physical characteristics and the prospect of being able to separate them either mechanically or by metallurgical means. . . . A knowledge of economic mineralogy is of supreme importance to the mining man as producer and seller, and to the metallurgist as buyer and user."

**DETAILS OF PRACTICAL MINING, by the editorial staff of the Engineering and Mining Journal. Published by McGraw-Hill Book Co., New York. Price $5.00. For sale by Book Department Canadian Mining Journal.**

This volume is similar to the "Handbook of Mining Details" published in 1912. It is a collection of articles that have appeared during the last two or three years in the Engineering and Mining Journal. The book is full of suggestions for those in charge of operations. The material has been contributed by many authors and does not lend itself readily to classification. The editors have, however, found it possible to group the articles into thirteen chapters headed: Surface plant and operations, explosives, rock drills, shafts and raises, drifting, stoping, timber structures, hoisting, lowering and transporting, shaft conveyances, cars, track, safety and sanitation, and drainage and ventilation. For useful hints on how to do it, we recommend this volume.

# BENZOL*

By Geo. Taylor

One of the most important matters at present before the carbonizing world is the recovery and rectification of benzine and its homologues from the gases evolved in the destructive distillation of coal. Knowledge of the formation of benzine in gas is not very conclusive. It has been found that in distilling coal at low temperatures paraffins result, and that on increasing these temperatures a diminution in the amount of paraffins takes place, along with the production of benzols, until at 650 deg. C. the condensable hydro-carbons are almost exclusively those of the benzine series. In coke-oven gas the volume due to the presence of benzol as vapor ranges from about 0.8 to 1.6 per cent. of the total, which corresponds to 2-4 gallons of benzol per ton of coal distilled. The removal of the benzol is, of course, attended by a corresponding diminution in the volume of the gas, a falling off in calorific value of from 32 to 64 B.T.U. per cu. ft. gross, and a considerable loss in illuminating power. In order that little of the benzol shall be removed in tar extraction, it is necessary that this process be carried out at a temperature of not less than 35 deg. C., the gas being suitably cooled for ammonia scrubbing afterwards. In the case of direct processes, where the tar fog is extracted from hot gas, there is no risk of benzol being removed with the tar. Before entering the benzol scrubbers the gas should be freed from water by a trap.

**Washing Mediums and Plant.** Presuming then that the gas is freed from ammonia, tar, and mechanically-carried moisture, and that its temperature is below 25 deg. C., the next problem is the absorption of the benzol as completely as possible. Two absorbing mediums are in general use—coal-tar creosote and blast-furnace oil. The methods of using these oils being different, it is necessary that they should not be mixed. Considering that the ultimate aim of the process is the production of pure benzine, etc., it is advisable to use oils that contain the smallest possible amounts of matters not helpful to absorption. Such are phenols, phenoloids, basic compounds, naphthalene, and tarry substances. If present, these impurities should be removed from the oil before its use as an absorbent, as by this procedure the life of the oil is prolonged, and the loss in washing the recovered benzols is much reduced; also, the water separates more easily from the oil in the storage tanks.

With regard to the plant necessary for oil washing, tower scrubbers of about the same capacity as those used for ammonia extraction are usual, and oil is circulated through them in a similar manner to that in which liquor is circulated in ammonia scrubbers. There is, however, a growing tendency to adopt rotary scrubbers, usually of the brush type. These scrubbers are highly efficient, and by reason of the more intimate contact of oil with the gas a higher percentage absorption is obtained than is the case with tower scrubbers; also, the plant can be arranged so that the power expended in circulating the oil is less. Another advantage is economy of ground space. A rotary scrubber of 8 ft. internal diameter, with eight to ten washing chambers, is capable of dealing with gas from 200 tons of coal per diem.

According to the quantity of coal carbonized, the circulating stock should be from 40 to 80 tons, and the fresh oil required to make good losses runs from 20 to 35 gallons per 100 gallons of benzol made—unless it is salty, when somewhat more will be used.

**Distillation.** It is generally admitted that, for economy, an exchange of heat should take place between the incoming rich oil and the hot debenzolized oil from the still. In some cases the rich oil is heated further by steam heaters. This is particularly the case where the still is being worked up to its full capacity and space cannot be afforded to allow the dephlegmatory action of a colder oil. The stills themselves fall into two classes: one in which powerful steam heaters are placed in a chamber at the base of the still, with the intention of drying the effluent oil, and the other which works with wet steam only. In the latter type provision should be made for separating the water from the oil whilst still hot. Vapors of water and benzol leave the still at about 100 deg. to 112 deg. C., and must be partially condensed or dephlegmated in order that a 65 per cent. benzol may be obtained. The fraction which condenses at a temperature of less than 95 deg. C. is the required material. The heavier matters consist of water, naphthalene, light oil, and phenols, and are usually small in quantity. In connection with the condensing of the benzol it is highly important that no back pressure should be thrown in this process. If this is not the case, difficulty will be experienced in denuding the oil of benzol, and losses will take place.

A high saturation of oil, where consistent with a good return gas, is much to be desired; also, the oil should certainly be heated to 110 deg. C. in the still. Should this not be the case, and the effluent oil contains over 0.5 per cent. of benzol, the steam supply should be superheated. From information to hand concerning two plants, the introduction of superheated steam increased the yields of benzol about 5 per cent.

**Purification and Fractionation.** Basic impurities are easily removed by acid washing, but if it is necessary to remove thiophene also, the acid washing must be repeated and prolonged until the laboratory sample gives a negative result by the isatin test. In any case, the completion of the washing should be ascertained by distilling a sample from the washer and treating the distillate corresponding to 90 per cent. benzol with 10 per cent. of pure sulphuric acid.

The acid washing is followed by a water washing. Here care must be taken to avoid a violent agitation, but the water should rather be used to rinse the sides of the washer, as some benzols have a tendency to emulsify with water and cause large washing loss. The acid washings treated with water separate into solid resinous matter and an acid liquor, from which pyridine may be separated by treatment with ammonia liquor and the resulting sulphate solution used in the sulphate house. The benzol is then washed with an excess of 20 deg. Tw. caustic soda solution which removes the traces of sulphuric and sulphurous acids and any phenols that are present. The caustic solution may be used until spent.

The still employed for "blowing over" the benzol is of 3,000 to 4,000 gallons capacity, has twelve to fifteen trays in the fractionating column, and is provided with direct and indirect steam heating. The charge may be considered as worked off when the distillate boils at 200 deg. C., or when naphthalene becomes evident. The once-run benzol must then be separated into commercial fractions by distillation in a rectifying still. Many types of these have been erected, the following being the essential features:—The body of the still should be of the short horizontal, cylindrical shape, and heat supplied by a large number of steam pipes running through the still and a wet steam coil. The fractionating column should be of ample capacity, the two main varieties now at work being the cap and plate introduced into benzol distillation by Heckmann, and the perforated plate originally adopted in Coffey's still. Differences in detail are found in the size and shape of the caps, depth of seal, position and shape of overflow; also in the number and size of holes in the perforated plate. It is worth noting that whilst newcomers in this field erect complicated plant, with cap-and-plate rectifying columns, benzol distillers of old-standing show a preference for simple plant and perforated plate column. As a number of stills of the latter kind are successfully producing pure benzine and toluene, it would appear that the

*Abstract of a paper read December 18,, before the Coke Oven Managers' Association, England, and published in Iron & Coal Trades Review Dec.

opinion prevailing in some quarters that only the cap-and-plate column will produce a pure product is scarcely correct.

The points at which the distillates should be changed into different receivers may be ascertained in two ways. The approximate quantities of each distillate are usually known. If, therefore, the tank into which the distillate is running gives the correct distillation test the receiver should be changed. This necessitates the constant attendance of someone able to make and interpret the tests. Alternatively, a litre sample may be fractionated in the laboratory, and the results being compared with the work results, it is possible to forecast the yields from future distillations with a fair degree of accuracy.

## TUNGSTEN PRODUCTION IN U.S. IN 1915

The production of tungsten ores in the United States during 1915 broke the record and was apparently equivalent to about 2,165 short tons of concentrates, carrying 60 per cent of tungsten trioxide ($WO_3$), and was valued at more than $2,000,000. These figures are based on preliminary returns to the United States Geological Survey. The largest previous output of tungsten ore was in 1910, when 1,821 tons was produced.

Conditions and prices in the tungsten market were unsettled and somewhat anomalous. Although the price in the latter part of 1914 was $9 or more a unit, 60 per cent ore was sold in the early part of 1915 as low as $5.80 a unit, so that tungsten mining did not start very briskly. Early in the summer, however, floods of orders for munitions of war caused a great demand for high-speed steels, to be used in cutting shells, rifle barrels, etc.; an embargo was declared by the British Goverment on the export of tungsten ores from any part of the British possessions, and there was soon a countrywide scramble for tungsten ores. Probably no one foresaw the height to which the price of tungsten would rise, and some operators contracted for ores at prices which in ordinary years would be high, but which were soon exceeded by several hundred percent. Tungsten metal was also contracted for at prices much below those afterward reached. In the fall the prices of tungsten reached un-heard-of heights; $48 per unit was paid for numerous lots, $50 for some, and even higher prices were reported. The prices moved upward so rapidly and unexpectedly that strenuous tungsten prospecting did not follow at once, but early in the fall a large number of men were in the field looking for deposits.

The mining activities are described by Frank L. Hess in some detail. The output of the Boulder (Colorado) field was for various reasons not increased as had been hoped. Many properties had been worked by leasing, so that there was no development of ore bodies, for the ore had been removed as fast as it was exposed, and it is reported that in the Conger mine, whose shaft was sunk below the 800-foot level, ore development was disappointing. Sinking is said to have been continued. The output of the district was estimated by the Boulder County Metal Miners' Association as equivalent to 960 tons of 60 per cent concentrates.

In the Atolia (California) field there were great developments. The Atolia Mining Co. is reported to have employed more than 300 men, and many men worked the desert sands in the vicinity for float scheelite. P. J. Osdick discovered rich ore east of the Atolia Mining Co's. property and made large profits. On and near the Baltic claim a number of men worked the gravel of a shallow gulch for scheelite and the sands on the Sunshine and other claims are also reported to have been worked at a profit. Several gold mines also produced some scheelite. The Consolidated Gold Mines, in Randsburg, had found water at a depth of about 500 feet and this has been piped to the Atolia Mining Co's. mill, about 5 miles distant. Formerly water was hauled on the railroad for a distance of about 50 miles. The company is reported to have erected a new mill to treat its tailings.

Several discoveries of tungsten ores were reported from Gilpin County, Colo., but the most extensive discoveries, as indicated by the number of outcrops, were made in White Pine County, Nev. Veins of scheelite were found at several places between the Minerva district, 30 miles south of Osceola, and Cherry Creek, 50 miles north of the settlement. Some of the veins were formerly prospected for precious metals, but the scheelite was not recognized. The hubnerite mine and mill 12 miles south of Osceola were actively operated toward the close of the season; the mill at Camp Bonita, on the east side of the Snake Range, was operated part of the year, and mills were erected or started by the St. Anthony Mines Co. at Toy (Browns), Humboldt County, by A. R. Shepard and associates in the Reagan district, and by the Doyle Mining Co. in Sacramento Pass, White Pine County. Some hubnerite was dry washed from desert sands at Round Mountain and Spanish Springs, Nev.

The dumps of gold mines at White Oaks, N. Mex., were worked over for hubnerite and yielded a considerable quantity of concentrates, and at Tip Top, Ariz., a mill was under construction to work the tailings and dumps of the old Tip Top silver mine for the wolframite they contained.

Mills were erected by the Primos Chemical Co. at Dragoon and by the National Tungsten Co. at Arivaca, Ariz., for treating the tungsten ores, and tungsten was produced at these places and at Camp Wood, Yucca, Oracle, and other points.

At Lead, S. Dak., the great Homestake gold mine produced wolframite from the claims west of the great open cut and the Wasp No. 2 mine, 2 miles south, produced a considerable quantity of ore. It is erecting a concentration plant. Only a little ore was produced in the southern Black Hills.

Small quantities of tungsten were produced in Idaho and at Silverton, Colo., and a few hundred pounds was saved from the old concentrates of the gold placers at Nome, Alaska.

The wolframite deposits on Tungsten Peak, near Cathedral Peak, 45 miles northwest of Oroville, Wash., became the property of the Tungsten Mines Co. and the new owners produced some ferrotungsten in an electric furnace at Tacoma.

The price of tungsten as metal or ferrotungsten rose from $1 a pound in January to $8 a pound in December. In the same period tungsten steels increased in price from 60 or 75 cents to $3 a pound.

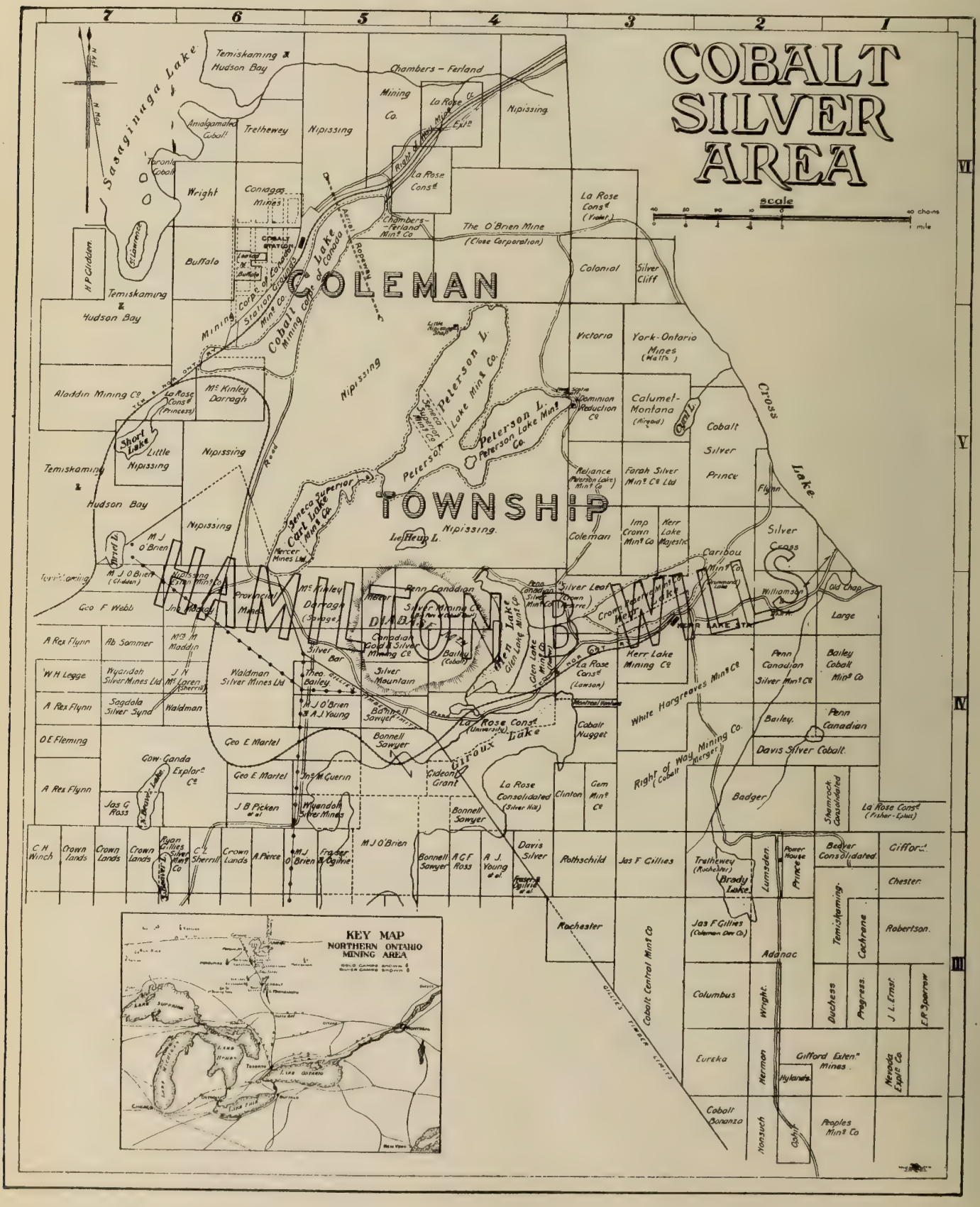
## ROAD TO FLINFLON.

Commissioner John A. Campbell informs a Pas Herald representative that the building of a road between Sturgeon and Athapapuskow lakes has been assured by the Government. In a few days an engineer will be sent into the northland to make all the necessary measurements, on the completion of which tenders will be at once called for for the construction of the road.

The production of the Cobalt area is unique in character. Cobalt area is not only the world's greatest producer of silver, but it absolutely controls the market for cobalt, has a large output of arsenic, and is one of the few producers of nickel.

## RIGHT OF WAY.

About four cars of ore per week is being shipped by the Right-of-Way Mining Co. to the Northern Customs concentrator at Mileage 104. Practically all of this is coming from the old stopes on the 83-foot and the 142-foot levels. All of it is low grade, however, but can be milled profitably. All operations are being carried on through the north shaft.—Cobalt Nugget.




**Map of Cobalt Lake Area, published by H. B. Wills, Toronto. Copies may be obtained free on application to H. B. Wills.**

## BUREAU OF MINES FIELD PARTIES.

The Ontario Bureau of Mines has a number of men in the field making geological maps and investigating mineral resources. Mr. C. W. Knight is doing some special work in Pre-Cambrian areas. Mr. A. G. Burrows is examining the country along the Canadian Northern Railway from Longue Lac to Lake Nepigon. Mr. P. E. Hopkins is at Tashota mapping the Kowkash area. Mr. Ellis Thompson and Mr. H. B. Ellsworth are examining the Rognon property and neighboring areas. Prof. A. L. Parsons is examining molybdenite properties. Prof. M. B. Baker is studying serpentine areas. Dr. A. Ledoux is collecting mineral specimens for exhibition purposes.

Dr. W. G. Miller, Provincial Geologist, and Mr. T. F. Sutherland, chief inspector of mines, are on the way to New Caledonia to examine the nickel mines there. Mr. E. A. Collins is acting chief inspector of mines.

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The Canadian Government will enlarge the mint at Ottawa to meet the great demand for gold caused by the war. A new temporary building will be erected immediately adjoining the present permanent structure, and the output of gold coinage will be considerably increased.

## KIRKLAND LAKE.

The construction of the power transmission line from the plant of the Northern Ontario Light and Power Co.'s station at Cobalt to Kirkland Lake is now under way and will, it is expected, be completed within three of four months. The route will be almost due north, the company having obtained right-of-way from the various townships between Cobalt and Kirkland Lake. The line will almost parallel the T. and N. O. Railway, although it is not actually located upon it. The power line will pass through the Boston Creek camp, where there are prospects for a big demand for power in the near future and at Kirkland Lake there are now five operating mines with prospects of others.—Cobalt Nugget.



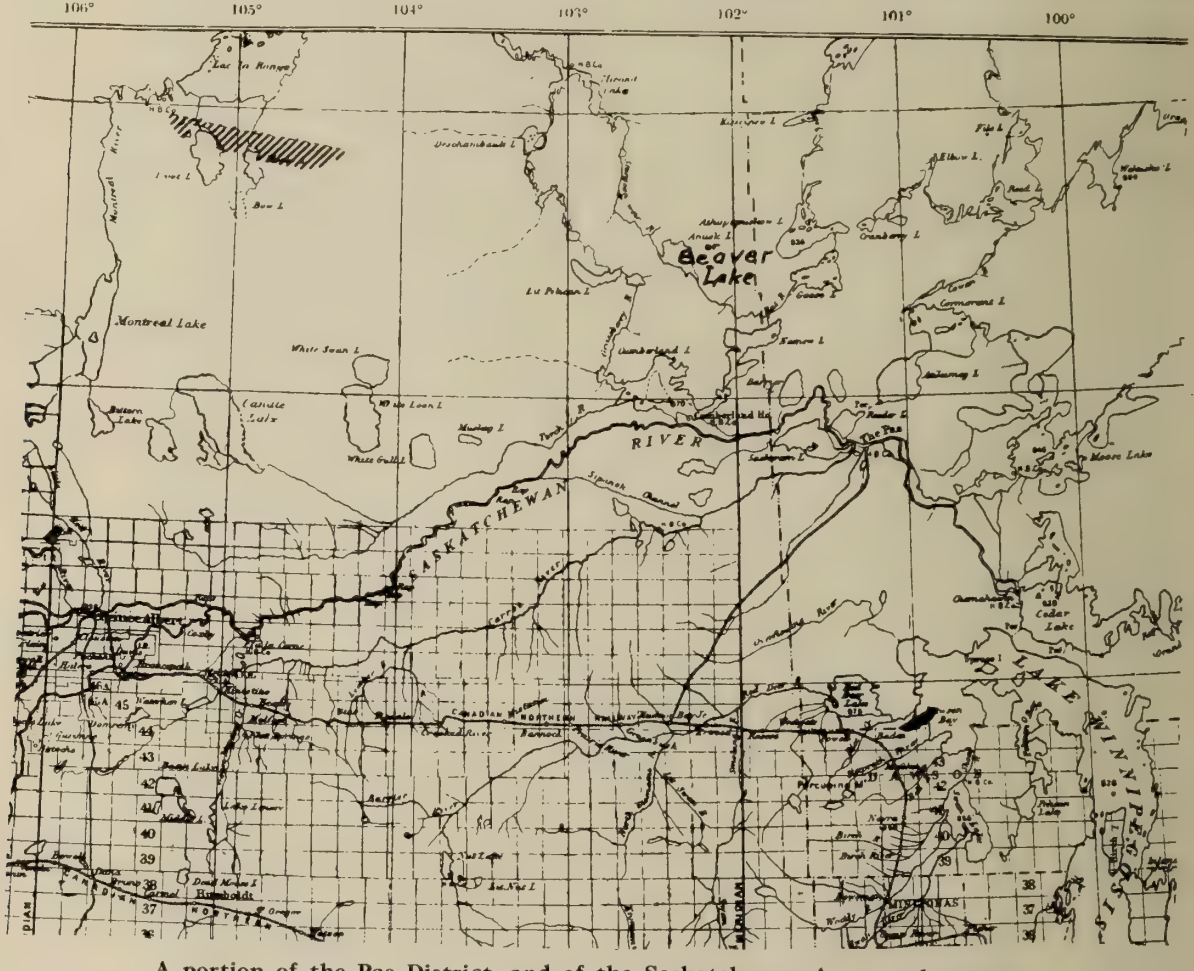
**Map of Cobalt Silver District. (From relief map prepared by A. A. Cole).**

## RED JACKET.

The workings of the old Red Jacket are practically free of water now. The pumps were started up about ten days ago and as the workings are not extensive the job was not a heavy one. The power plant of the old Red Jacket Co. was burned several years ago, but as the hydraulic air line runs close by, the question of power was easily solved by making a connection with it. Mr. Frank Hatch is managing the work for the syndicate operating the property.—Cobalt Nugget.

## THE PAS MINING DISTRICT

The Pas, Manitoba, July 7.—The establishment of The Pas mining district has been the subject of much favorable comment during the past week. The government, and particularly the Hon. Dr. Roche, are being commended for their early appreciation of the needs of the mining community. We understand that much outside opposition was brought to bear, but, fortunately for the mining interests of new Manitoba, the government took the proper view of the interests of the man on the ground. The prospectors, who have pioneered the district and brought it into the limelight, at the expense of time and money, are the men who deserve consideration, and this is the view that evidently determined the government to establish a mining district with headquarters at The Pas—the only place that can serve the prospectors.




**A portion of the Pas District, and of the Saskatchewan Area to the west.**

Hitherto the prospectors have been served by a subagency at The Pas. While this enabled the prospectors to record their claims, it served no other purpose. Complete records of claims recorded were kept at Dauphin and Prince Albert. Some claims were recorded only at the head offices, and consequently the prospector, to ascertain correct information, was forced to visit these places at considerable expense and loss of time. Blanketing claims was thus an easy matter.

The sale of claims was for the same reason unsatisfactory and tedious, as the buyer could not readily secure all the information desired. Prospective buyers have complained very bitterly of this fact.

Under the new arrangement, the office at The Pas will furnish all necessary information. Claim holders, prospectors and buyers will be able to ascertain fu information at once. This is as it should be, since th mining area is contiguous to The Pas, and all oppos tion was, therefore, purely selfish, but nevertheless wa strong, and the Hon. Dr. Roche deserves credit for hav ing considered only the needs of the district, and o the men who are responsible for its development.

The mineral bearing area of the Northland lies chiefl in the Province of Manitoba. The western extremit penetrates the Province of Saskatchewan a short di tance at Beaver lake. The Beaver lake fields are, there fore, a part and parcel of the Manitoba mineral bel and can only be reached readily via The Pas. Logica ly the Beaver lake fields should be included in The Pa mining district, but, unfortunately, the government wa not able to say "No" to Saskatchewan demands tha the provincial boundary must be recognized. The gov ernment cannot be blamed for the handicap thus place upon or rather not removed from Beaver lake prospectors, and it is now up to those interested in the Beaver lake fields to do their utmost to overcome the selfish opposition that deprives them of the privileges to be enjoyed by their neighbors a few miles across the imaginary fence.

The new district, as established, will be a boon to the mining industry in New Manitoba, and will encourage more energetic efforts to develop the marvellous mineral wealth that has been proven to exist. Not only the mining men, but every resident of the district has every reason to be pleased, and to hope that this evi dence of the good-will of the government is only the beginning of many things that will be done to develop the resources of Northern Manitoba.—The Pas Herald.

## A NEW GOLD RUSH.

A number of local prospectors have gone into Allard Portage, a point about 67 miles north as the crow flies, from Amos on the National Transcontinental Railway and about 200 miles east of Cochrane. According to what can be learned at present the first discovery was made by James McDonough, of Haileybury, on a creek leading off the Hurricanaw river. The trip is one hundred miles by canoe. Some time ago McDonough found the lead and brought down some samples that looked very promising, but on assaying these they ran higher than anticipated. The lead is said to be between twenty and thirty feet wide.—Cobalt Nugget.



**COBALT STATION IN 1916**
**Showing tube mills for oil flotation plant**

## MILLER INDEPENDENCE.

So encouraging have been tests by the Nissen stamp mill that the Miller Independence Mines, Limited, of Boston Creek, has decided to instal a 4½-foot ball mill and maintain a steady production. It is thought that the addition will enable the company to secure a milling capacity of about forty tons a day. As the ore is not free milling, containing gold carrying tellurides, iron and copper pyrites, the concentrates will be shipped. A flotation system may also be used.

The ore shipped to date and the two tons shipped was taken from open cuts along the flat vein over a distance of about a thousand feet. The shaft was sunk 150 feet north of the vein outcropping, and had the vein continued its slight dip would have been cut at fifty feet. Evidences in the shaft point to it having straightened up and a level was established at 75 feet. Some delay has occurred by trouble with the drills, and crosscutting handicapped. A second boiler for the mill will be hauled out shortly.—Northern Miner.

## ADANAC.

Cobalt, July 8.—The vein on the Adanac property upon which ruby and native silver was found this week at the 800-foot level, is about 14 inches in width in some places. The new find is very promising and may prove important. Within the past six months or more several finds have been made on this property, but the high-grade has so far been very patchy, none of the discoveries proving of any consequence. The west winze, in which the discovery was made, is now about 315 feet in depth and the management proposes to continue this to a depth of 400 feet, and from that level crosscut to tap four other veins having the same characteristics as the one in which the ruby silver was found below the 300-ft. level. From the 400-ft. level a raise will be put up to connect with the present shaft.—Cobalt Nugget.

## QUAKER CITY.

Arrangements have been made whereby the old Quaker City property will be re-opened and operated. Already pumps are going de-watering the shaft and workings, after which an examination of the property will be made preparatory to the commencement of a program of further exploration. The property is near the Beaver and Temiskaming and its good location leads to the belief that exploration may lead to the finding of ore in paying quantities. The shaft is about 210 feet in depth with 92 feet of drifting at the 110-foot level. The formation is keewatin and granite. The company is controlled by Philadelphia men and is capitalized at $1,000,000 with the shares of a par value of $1 each.—Cobalt Nugget.

## KENABECK SILVER.

Cobalt, July 8.—Since the first of the year there has been considerable activity in the Kenabeck district. In Auld township the Kenabeck Silver Mines, Limited, have been doing considerable work on a Veteran claim on 160 acres. This company has been operating since February and good silver values have been obtained from two veins which run parallel to each other across the property. The company has undertaken the exploration and development of these claims in a manner that indicates an extensive plan of operations. A five-drill compressor plant has been installed, driven by two 40 h.p. boilers. On the No. 1 vein one drill is sinking the main shaft and another drill will be put on No. 2 vein this month to drive a tunnel into a high hill, following the vein all the way.

The vein matter contains silver, cobalt and nickelite and the company claims that shipping ore is in sight and now that the air plant has been installed and in operation it is the intention to push development energetically. Mr. W. H. Jeffrey is manager.



**McKinley-Darragh Mine, 1916**

## DOME LAKE.

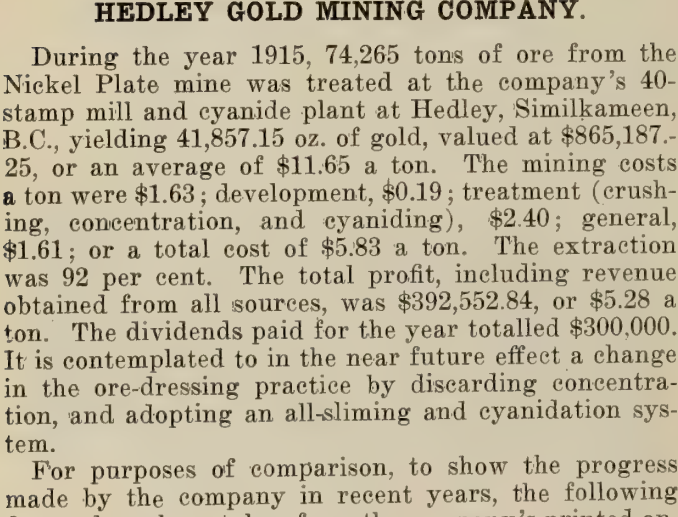
The Dome Lake is developing what looks to be the best vein found in the mine to date. It was located on a crosscut west of the shaft and besides showing spectacular values is in one place twenty feet wide. The average width along the fifty odd feet it has been proved up so far will average better than twelve feet. Where first cut on the 300-foot level values ran up to ten dollars a ton, but short raises made on it have shown assays across twenty feet of close to fifty dollars a ton, values greatly increasing with the work in the raises.

The new vein promises to raise the average grade of ore treated, though last year with a small mill that has since been doubled, the Dome Lake made a profit. Some directors and large shareholders have been visiting the property lately and are greatly elated over the strike.—Northern Miner.

## McINTYRE.

Diamond drilling on the McIntyre from No. 5 shaft on the 500-foot level has indicated an orebody at a depth of 900 feet that shows $36 across 22 feet. The "boundary vein" along the McIntyre Extension line on the 100-foot level has been drifted on the 100 feet into both properties and shows a continuation of both values and width along the length as when the crosscut first went through it. As this was 25 feet of $15.30 ore the importance of the orebody is just becoming known.

The station at the 1,000-foot level has been completed and raising to connect up with No. 5 shaft is about to start. A crosscut will be driven south at this level from the station to cut the contact between the quartz porphyry and basalt. The large vein found on the 700-foot continues to show high values over widths of twenty feet and more.—Northern Miner.



**Cobalt Lake Mine 1916**

## HEDLEY GOLD MINING COMPANY.

During the year 1915, 74,265 tons of ore from the Nickel Plate mine was treated at the company's 40-stamp mill and cyanide plant at Hedley, Similkameen, B.C., yielding 41,857.15 oz. of gold, valued at $865,187.25, or an average of $11.65 a ton. The mining costs a ton were $1.63; development, $0.19; treatment (crushing, concentration, and cyaniding), $2.40; general, $1.61; or a total cost of $5.83 a ton. The extraction was 92 per cent. The total profit, including revenue obtained from all sources, was $392,552.84, or $5.28 a ton. The dividends paid for the year totalled $300,000. It is contemplated to in the near future effect a change in the ore-dressing practice by discarding concentration, and adopting an all-sliming and cyanidation system.

For purposes of comparison, to show the progress made by the company in recent years, the following figures have been taken from the company's printed annual reports:

| | | | | |
|---|---|---|---|---|
| Lode gold .. | *1,181,713 | 24,426,009 | *1,249,915 | 25,835,742 |

| Year. | Tons of ore Crushed. | Receipts. | Expenditure. | Net. Profit. |
|---|---|---|---|---|
| 1910 ..... | 46,828 | $527,137.65 | $255,369.98 | $271,767.67 |
| 1911 ..... | 57,815 | 688,966.50 | 370,814.29 | 318,152.21 |
| 1912 ..... | 70,453 | 748,133.14 | 362,253.14 | 385,880.00 |
| 1913 ..... | 70,796 | 802,330.40 | 397,075.51 | 405,254.89 |
| 1914 ..... | 78,494 | 797,340.76 | 409,112.11 | 388,228.65 |
| Totals ... | 324,388 | $3,563,908.45 | $1,794,825.03 | $1,769,283.42 |

The receipts include interest on moneys in bank, received during the five years, $40,642.90. The yearly averages for the five-year period are as follows: Tons of ore crushed, 64,877; receipts, $712,781.69; expenditure, $358,925; profit, $353,856.69. The total of dividends paid during the five years was $1,488.000, on an issued capital of $1,200,000.

## BOOK REVIEW.

**COAL MINERS' POCKETBOOK—11th Edition, Revised, Enlarged and Reset—McGraw-Hill Book Co., New York—For sale by Book Department Canadian Mining Journal.**

This book, formerly known as the "Coal and Meta Miners' Pocketbook," contains a wealth of data ar ranged conveniently for handy reference. The con tents are indicated by the following section headings Weights and Measures; Mathematics; Surveying; Me chanics; Strength of Materials; Concrete; Masonry Wire Ropes; Power Transmission; Properties of Ma terials; Hydrostatics; Hydraulics; Heat and Fuels Boilers; Steam Engines; Compressed Air; Electricity Internal Combustion Engines; Prospecting; Mining Explosives; Supporting Excavations; Hoisting; Haul age; Ventilation; Mine Fires; Preparation of Coal Safety and First Aid; Mine Safety; Tables of Natura Sines, etc.; Logarithmic Tables; Traverse Tables; Glos sary of Mining Terms.

The volume is an attractive one of 1,172 pages boun in leather.

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On June 6, Mr. Seymour Baker arrived at Ashcroft B. C., from England, en route to Barkerville, Caribo Mr. Baker is continuing to give attention to gold-quart mining. In the Annual Report of the Minister of Mine for 1914 particulars were given of his work on the Pros perine group, and it was added that "in the operation o the hydraulic mines in the district a small percentag of concentrates as well as the gold is collected in th sluice boxes. These concentrates consist of the typica black sand—mainly magnetite—as well as various sul phides, such as galena, iron pyrites and arsenopyrit and in addition nails, lead shot, pieces of iron, etc. A might be expected, these concentrates contain hig



**Chambers-Ferland Shaft-house, 1916.**

value in gold, which probably occurs partly in the su phides and partly as 'rusty' gold which will not amalg mate. They are put through a rough treatment by ap plying cyanide to brighten the gold and then by ama gamation. This treatment is not very efficacious, an of course, does not extract the value from the sulphide The residue is thrown away, as, so far, it has not pai the operators to bother with it further.

"For the past five years Seymour Baker has bee working out a cyanide scheme to treat these concentrate He has a lease on the old Government reduction work a couple of miles below Barkerville, and has put in small cyanide-leaching system. As yet he has not actua ly treated any of these concentrates in commercial quan tities, but he hopes to be able to do so before long. Th whole thing is, however, not of great importance, as th actual quantity of concentrates secured in the hydrau icking operations is small."

## PERSONAL AND GENERAL

Prof. Albert Ledoux, of the University of Brussels, is collecting for the Ontario Bureau of Mines mineral specimens for exhibition purposes. Prof. Ledoux, during the past year has been on the staff of the Department of Mineralogy, University of Toronto.

Mr. A. G. Burrows, of the Ontario Bureau of Mines, is making an examination of the country along the C. N. O. Railway, from Longue Lac westerly to Lake Nipigon.

Mr. P. E. Hopkins, with three assistants, is at Tashota, continuing the geological mapping of the Kowkash area.

Mr. Ellis Thompson and Mr. H. B. Ellsworth have been engaged by the Ontario Bureau of Mines to map the Rognon and adjoining properties near Dryden, Ont.

Prof. A. L. Parsons of the University of Toronto, is examining molybdenite properties for the Ontario Bureau of Mines.

Prof. M. B. Baker, of Queen's University, is at Long Lake mine, in the Sudbury district, for the Ontario Bureau of Mines.

Mr. E. A. Collins, one of the inspectors of mines of Ontario, is acting chief inspector during the absence of Mr. T. F. Sutherland, who is en route to New Caledonia.

Mr. J. B. Tyrrell, of Toronto, is spending some time in British Columbia. His address while there will be Vancouver Hotel, Vancouver, B.C.

Mr. F. K. Brunton, formerly assistant superintendent the British Columbia Copper Co's smeltery at Greenwood, B. C., is now on the staff of the A S & R Co's smelting works at Garfield, Utah.

Mr. O. B. Perry, general manager of the Yukon Gold Co., was in San Francisco last month.

Mr. L. P. Robert, of the West Canadian Collieries company's staff, has returned to Blairmore, Alberta, from a trip to Illinois.

Mr. Geo. A. Gordon, superintendent of the Standard Silver-Lead Mining Co's silver-lead-zinc concentrating mill at Silverton, Slocan Lake, B. C., was in Nelson, on June 15, en route to Winnipeg, Manitoba.

Lieut. L. B. Reynolds, of Nelson, B. C., one of a number of Kootenay mining engineers who a few weeks after the outbreak of the European war volunteered for active service and were soon engaged in engineering work on the Continent, was one of several wounded men who returned to Canada last month. Several years ago Lieutenant Reynolds was manager of the Eureka copper mine, at the head of Eagle creek, a few miles west of Nelson.

Mr. T. J. Vaughan-Rhys, for several years associated with various mining enterprises in Portland Canal division and other parts of the northern Coast district of British Columbia, recently took charge of development work at a mine in Cedar Canyon district, on the State of Washington side of the International Boundary line.

Mr. F. T. Hamshaw, formerly operating in Atlin mining camp, in Cassiar district of British Columbia, was in Spokane, Washington, last month.

Mr Bruce Rose, of the Geological Survey of Canada, has resumed geological work in the neighborhood of Blairmore, in Southwest Alberta.

Dr. Alfred W. G. Wilson, of the Mines Branch of the Canada Department of Mines, visited West Kootenay district, British Columbia, last month. He was accompanied by Mr. A. Buisson, also of the Mines Branch.

Mr. Jas. F. Flynn, who is operating a copper mine at Massey, Ont., was in Toronto last week.

Mr. W. Yolen Williams, of Spokane, Washington, who was for years superintendent for the Granby Consolidated Co. during the period in which the chief part of the development of its big copper mines in Boundary District of British Columbia was done, was at the Crescent property, south of Ainsworth, B.C., last month.

Mr. J. J. Warren, of Toronto, managing director of the Consolidated Mining and Smelting Co., has been spending some time at the company's big reduction work at Trail, B. C.

Mr. G. G. S. Scott has returned to Toronto after being some time in the West. Recently he has been examining properties in The Pas mining district.

Dr. J. A. Bancroft, of McGill University, leaves this week to make a reconnaissance survey of that portion of the Trancontinental Railway between La Tuque and Bell River.

Siemens & Co. of Canada, Montreal, have recently supplied to the Canadian Government Department of Public Works, 17¼ knots of deep sea type, submarine cable.

Capt. Jas. G. Ross, who went to France with the 13th Canadian Battalion Royal Highlanders of Canada, and was wounded at Festubert, has returned to Canada and resumed his practice as consulting mining engineer with the Milton Hersey Co., Ltd., Montreal.

## OBITUARY

The death occurred in Chicago on June 16 of Mr. Samuel H. Reynolds, of Winnipeg, Manitoba, formerly of Victoria, B. C., at which latter place he was, several years ago, managing director of the Pacific Coast Coal Mines, Ltd, which operated the Fiddick coal mine at South Wellington, Nanaimo district of Vancouver Island, and commenced the development of the Suquash mine, Malcolm island off the northeast coast of Vancouver Island. About October, 1913, being an experienced engineer, he was appointed head of the Greater Winnipeg Water Commission, which has charge of the water supply undertaking now in progress for Winnipeg and surrounding district. He was a member of the Canadian Mining Institute, having joined in 1910. His death was sudden, the result of heart failure. He had been to New York on a business visit and was on his way back to Winnnipeg when he was stricken and died.

Early in June the death occurred of William Teague, a widely-known British Columbia pioneer, who had lived in that province about 58 years. He was a native of St Day, Cornwall, England, and was 81 years of age at the time of his death, which took place at the home of a daughter, Mrs. W. A. Nunan, in Seattle, Washington. He went to British Columbia in the Oregon, the first steamer to make the call at Victoria from San Francisco. Proceeding thence to Hope, on Fraser river, he worked at placer-gold mining on Cornish bar. In 1873 he was appointed Provincial Government Agent at Yale, where he remained twelve years. After leaving the Government service, he resumed mining, but later retired to private life.

# SPECIAL CORRESPONDENCE

Mineral production during the latter part of June and the first half of July will be less than had been expected, by reason of the flooded state of mountain streams and the consequent difficulties attending transportation of ore. A late cold spring prevented the usual gradual melting of the snow that during last winter had accumulated on the mountains. About the middle of June summer weather was experienced and the snow melted so rapidly that rivers and creeks soon became torrents and damage to roads, in many gulches constructed on the banks of the streams, was done in numerous places throughout the mountainous districts. Water ditches, flumes and pipe lines were carried out here and there, and in many places where power was being generated direct by the use of waterwheels or in others where there are hydro-electric power installations, trouble resulted, though in most cases the interruption caused to mining and milling operations will not be of long duration.

Among dividends recently declared by metalliferous mining companies operating in the province is that of the Granby Consolidated Co., which will shortly pay a dividend of $2 a share instead of $1.50, which latter had been the amount per share of profit distributions for some time past. The total of the dividend last declared will be $299,970, as compared with previous amounts of $224,977. The total of the three dividends for the year to date will be $749,925.

### East Kootenay.

The **Sullivan mine** has been shipping to Trail approximately 1,800 tons of ore a week latterly, but the washing out of a railway bridge will check the output temporarily. Probably there is a sufficiently large reserve of Sullivan ore in the stock pile at the Trail smelting works to keep the lead furnaces going until fresh supplies can be sent from the mine at Kimberley. Ore for the electrolytic zinc plant at Trail is also obtained from the Sullivan, though not in such large quantity as for the lead side of the reduction works.

Reports current are to the effect that there is a **brisk demand for coal and coke** from Crowsnest district mines and coke ovens; larger, in fact, than the collieries can supply with the scarcity of good coal miners that has been experienced lately. The streams flowing in the Elk valley, down which run the railways that transport fuel to Kootenay and Boundary districts, have been in high flood for a week, and traffic has been carried on under difficulties, yet the railway companies are doing all in their power to overcome obstacles to the regular maintenance of a sufficient supply of the coal and coke needed for the mining and smelting industries of the districts above mentioned.

### West Kootenay.

**Ainsworth.**—A great rush of water following the rapid melting of snow at high elevations during a recent spell of summer weather, caused such damage to the water-line to the New Canadian Metal Co.'s power house that a temporary suspension of operations in both the **Bluebell** mine and the concentrating mill at Riondel, Kootenay Lake, has resulted. The dam at the intake, and part of the pipe line, were damaged. Repairs are being effected, and it is hoped that the mine pumps will soon be at work again and that it will be practicable to shortly resume the extraction of ore and get the concentrator in operation once more.

Preparations are being made to start the Cork-Province concentrating mill on its season's run, now that there is plenty of water available for power purposes. During recent weeks there has been only a few men at work in the mine. About two carloads of crude ore of shipping grade is ready for hauling to the K. & S. railway. Another important shoot of ore has been opened in the mine, so it is expected the ensuing season's results will be profitable. High water in Kaslo creek has caused washouts in several places, so that the running of railway trains has been interrupted, but it is unlikely the delay will last more than a week or ten days longer.

**Slocan.**—Leaving out of consideration the temporary set-back caused by flood waters, mining matters generally are in a satisfactory condition in this district. The Slocan Star has been shipping silver-lead ore and concentrate in larger quantity during quite recent weeks than for some time past, and the additions being made to mine and mill plant are preparatory to further increasing the output. The construction of a concentrating mill for the Surprise, which last year was one of the larger producers of the district, is in progress. Plans for the further development of the Noble Five, in which good ore was found recently at considerable depth, are having the consideration of the owners. The Ruth-Hope mill has had its water supply facilities improved. The Rambler-Cariboo has been doing well, and its outlook is reported to be most satisfactory. The Lucky Jim operations have been profitable, and notwithstanding that there has been a temporary stoppage of ore shipping, this will not be a serious matter, since transportation conditions will soon be normal again. In Silverton camp both the Standard and Hewitt will have to await repairs of the water line, in the former case, and of the wagon road to Silverton, in the latter, before ore shipment can be resumed. The Galena Farm, however, is so situated that flood waters affect it little if at all, so will continue production as usual. A number of small properties in the district are having development work done on them and some of them are making occasional small shipments of ore, with promise in several instances of improvement.

**Nelson.**—From the Daily News it is learned that approximately $8,000 was the value of a bar of gold deposited in a local bank on June 15 by one of the lessees of the Granite-Poorman group of gold mines situated within half a dozen miles of the town of Nelson. This was the result of 18 days' mill-run; in addition there was gold left on the plates estimated at $2,000, and a quantity of concentrate from the tables for shipment to the smeltery. Although not a large production, this result is pleasing, since it is from a property formerly operated by a company which was a financial failure and was put into liquidation.

Mr. W. R. Salsbury, of Salmo, has bonded two claims on Bear Creek, a tributary of Sheep creek. It is stated that there is a good showing of silver-lead-zinc ore on the property. Mr. Salsbury for some time operated the Hudson Bay mine under lease, and was so energetic that he shipped between 1,000 and 2,000 tons of oxidized zinc ore to United States reduction works and consequently gave the mine such prominence that it has since been acquired by well-known New York mining men.

**Trail.**—Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works at Trail during the week ended June 14, totalled 10,826 tons of which 8,874 tons was from the company's own mines and 1,952 tons was of custom ores. The mines operated by the company that shipped ore were the Sullivan, in East Kootenay district; the Centre Star group and Le Roi, in Rossland camp; and the Highland, near Ainsworth.

Total of receipts of ore for the calendar year, to June 14, inclusive, is 224,128 tons, of which 187,343 tons came from mines operated by the Consolidated Company, and 36,785 tons were custom ores. The company's Rossland mines supplied 149,707 tons, or about two-thirds of the total; the next largest shipper was the company's Sullivan mine, at Kimberley, East Kootenay, from which 33,633 tons was received, some of it zinc ore, but the larger proportion lead ore. Of the custom ore, nearly 13,000 tons came from the United States, chiefly from mines in the northern part of the State of Washington.

### Boundary.

Work having been resumed on the Big Copper, in Copper camp, five or six miles west of Greenwood, it is expected that shipment of ore to the British Columbia Copper Co.'s smeltery at Greenwood will be commenced shortly. Several carloads of ore will be shipped for a bulk test; it will have to be hauled about three miles over a wagon road to the railway at Deadwood.

It is stated that ore from the Bullwhacker mine at Butte, Monta., is to be treated at the Greenwood smelting works if favorable freight rates shall be secured. The second large blast furnace at these works was blown in last month, which leaves only the smaller one not in operation.

The discovery of a promising vein of copper ore on the Dolphin claim, in Olalla camp, near Keremeos, is reported. The known occurrence of molybdenite ore in the neighborhood has induced prospectors to give attention once again to Olalla camp in which there are some good showings of mineral, but not much development work has been done in the camp in recent years.

Both the Granby Consolidated and the British Columbia Copper Co. are operating to the full extent that conditions will permit. The former is stated to have the whole eight of its blast furnaces at its Grand Forks smelting works running, while the latter has its two large furnaces in operation, leaving only the smaller one idle now.

### General Notes.

Much destruction of business premises in the town of Atlin, the distributing centre for the Atlin gold field, in Cassiar district, has resulted from a fire which took place on June 15. The Royal Hotel, a restaurant, half a dozen stores, and a number of smaller buildings were burned. The Provincial Government buildings were saved, also a new hotel in course of erection. On May 23,1914, a similar disaster caused much loss to local property owners.

The Velvet-Portland mine, near Rossland, has been bonded, and further development work has been undertaken.

## TRETHEWEY.

The Trethewey Mining Co. is to-day loading two cars for shipment. One is of high-grade and the other of low-grade concentrates. This is the first shipment from the Trethewey since operations were resumed on June 1st last.—Cobalt Nugget.

## GENESEE MINING CO.

The shaft of the Genesee Mining Co. is now down a depth of 150 feet. At a depth of 120 feet a narrow stringer came in the shaft and at 150 feet this has widened out to an average of two inches. In some places, pockets 4 inches or more in width have been cut through. This vein comes in between the two original veins showing on the surface, and on the upper levels. Sinking is proceeding at a steady pace and no trouble is being experienced from water troubles. The shaft is now down half of the distance called for by the plan of exploration, from the 300-foot level in the lower strata of conglomerate.—Cobalt Nugget.

## AUGARITA.

For the past month a gang of men have been at work putting up buildings, cutting roads and getting things in shape for the carrying out of a system of exploration by diamond drilling at the Augarita Mines Co. property at South Porcupine.

The company controls three claims, approximately 120 acres, in the Dome section of the camp, and according to information received from the gold camp a contract for several thousand feet of diamond drilling will be let. The members of the company are Buffalo people and on Saturday the annual meeting of the company was held in that city and the plan of operations discussed.

## McKINLEY-DARRAGH.

Cobalt, July 8.—The next hundred feet of crosscutting on the 400-foot level of the McKinley-Darragh will bring the drill into ground in which important discoveries are expected to be made, as this is well within the zone of proven orebodies. The new 150-ton Callow oil flotation plant is proving a big success, even greater than was anticipated and is making a saving of over $150 per day, or at the rate of $1 more per ton of ore treated, without the mill tonnage being raised. The McKinley-Darragh have had a very successful year to date and it is said that all dividend requirements for this year have already been earned.—Cobalt Nugget.

The editor of The Ledge, Greenwood, B. C., says:—

The holding of crown-granted mineral claims, for an indefinite period without development is a great injury to the mining industries of this province. The holders of such properities should be forced to work them, or relinquish their right, and let somebody else work them. We need workers, not idle speculators.

## SILVER PRICES.

| June— | New York. cents. | London. pence. |
|---|---|---|
| 24. | 66⅛ | 31 3/16 |
| 26. | 65¾ | 31⅜ |
| 27. | 66 | 31½ |
| 28. | 66¼ | 31⅝ |
| 29. | 65⅞ | 31 3/16 |
| 30. | 65 | 31 |
| July— | | |
| 1. | 65 | Closed |
| 3. | 65 | 31 |
| 4. | Holiday | 30⅜ |
| 5 | 63⅞ | 30½ |
| 6 | 63⅜ | 30¼ |

# MARKETS

## NEW YORK MARKETS.

July 6, 1916—Connellsville Coke—
Furnace, spot, $2.50 to $2.75.
Contract, $2.50 to $2.75.
Foundry, prompt, $3.25 to $3.50.
Contract, $3.50.
July 6, 1916—Straits Tin, nominal, 39.25 cents.
Copper—
Prime Lake, nominal, 26.00 to 26.50 cents.
Electrolytic, nominal, 25.75 to 26.25 cents.
Casting, nominal, 23.75 to 24.00 cents.
Lead, Trust price, 6.50 cents.
Lead outside, 6.40 to 6.50 cents.
Spelter, prompt western shipment, 9.42½ to 9.67½ cents.
Antimony—
Chinese and Japanese, 16.00 cents.
American, 16.00 cents.
Aluminum—nominal.
No. 1 Virgin, 98-99 per cent., 60.00 to 62.00 cents.
Pure, 98-99 per cent., remelt, 58.00 to 60.00 cents.
No. 12 alloy remelt, 47.00 to 49.00 cents.
Nickel, 45.00 to 50.00 cents.
Cadmium, nominal, $1.25 to $1.50.
Quicksilver, nominal, $80.00.
Platinum, nominal, $75.00.
Cobalt (metallic), $1.25.
Silver, 63 3-8 cents.
Metal Products—Following base prices are all f.o.b. mill:
Sheet copper, hot rolled, 37.50 cents.
Sheet copper, cold rolled, 38.50 cents.
Copper wire, nominal, 29.00 to 31.00 cents.
High sheet brass, 38.00 to 39.00 cents.
Seamless brass tubing, 44.00 to 45.00 cents.
Seamless copper tubing, 44.50 to 45.50 cents.
Brazed brass tubing, 45.50 to 46.50 cents.
Brass wire, 38.00 to 39.00 cents.
Brass rods, 38.00 to 39.00 cents.
Sheet zinc, f.o.b. smelter, 17.00 cents.

## TORONTO MARKETS.

July 11—(Quotations from Canada Metal Co., Toronto)—
Spelter, 15 cents per lb.
Lead, 8 ¾cents per lb.
Tin, 45 cents per lb.
Antimony, 25 cents per lb.
Copper, casting, 28½ cents per lb.
Electrolytic, 29½ cents per lb.
Ingot brass, yellow, 16 cents; red, 20 cents per lb.
July 11—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $8 per ton.
Coal, bituminous, $5.75 per ton.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto.)

As of Close July 10, 1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Atla. Cons. | .35 | .40 |
| Butte. | 5.87½ | 6.12½ |
| Can Car. | .64 | .70 |
| Curtiss Aeroplane | .30 | .40 |
| Chevrolet. | 2.30 | 2.35 |
| Can. Copper | 1.31 | 1.56 |
| Cambria Steel | .... | .85 |
| Emma Copper | .43 | .46 |
| Houston Oil | .14 | .17 |
| Howe Sound | 4.62 | 4.87 |
| International Petroleum | 10.00 | 10.25 |
| Inter. Nickel (New) | 47.37 | 47.62 |
| Kennecott Copper | 47.62 | 47.75 |
| Maxim Munitions | 5.50 | 6.00 |
| Midvale Steel | 62.75 | 63.25 |
| Marconi | 3.87 | 4.00 |
| Standard Shipbuilding | 5.00 | 12.00 |
| Submarine Boat | 35.00 | 36.00 |
| Tonopah Extension | 5.31 | 5.43 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex. | .06¼ | .06½ |
| Dome Consolidated | .... | .12 |
| Dome Extension | .36 | .36½ |
| Dome Lake | .31½ | .32 |
| Dome Mines | .... | 26.00 |
| Eldorado. | .00½ | .... |
| Foley O'Brien | .... | .50 |
| Gold Reef | .01 | .02 |
| Hollinger | 29.80 | 29.80 |
| Homestake. | .55 | .65 |
| Jupiter. | .31 | .32½ |
| McIntyre. | 1.55 | 1.57 |
| McIntyre Extension | .45 | .46 |
| Moneta. | .13½ | .13¾ |
| Porcupine Crown | .75 | .85 |
| Porcupine Imperial | .03⅝ | .03⅞ |
| Porcupine Tisdale | .01⅝ | .01⅞ |
| Porcupine Vipond | .... | .50 |
| Preston East Dome | .04½ | .05 |
| New Ray | .40 | .41 |
| Teck Hughes | .26¾ | .28 |
| West Dome Cons. | .37 | .38 |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac. | 1.80 | 1.85 |
| Bailey. | .07¼ | .07¾ |
| Beaver. | .37 | .39 |
| Buffalo | .... | 1.10 |
| Chambers Ferland | .19 | .19½ |
| Coniagas. | 4.75 | 5.00 |
| Crown Reserve | .46 | .48 |
| Foster. | .... | .09 |
| Gifford. | .05 | .05½ |
| Gould. | .... | .00½ |
| Great Northern | .04¾ | .05¾ |
| Hargraves | .03¾ | .04¼ |
| Hudson Bay | 50.00 | .... |
| Kerr Lake | 4.30 | 4.70 |
| La Rose | .60 | .65 |
| McKinley. | .52 | .54 |
| Nipissing. | 6.85 | 7.00 |
| Ophir. | .06½ | .06¾ |
| Peterson Lake | .24¼ | .24¾ |
| Right of Way | .05¼ | .05½ |
| Seneca Superior | .40 | .45 |
| Shamrock Cons. | .... | .11 |
| Temiskaming. | .57 | .57½ |
| Trethewey. | .22 | .23 |
| Wettlaufer. | .12 | .16 |

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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## Canadian Miner's Buying Directory.—(Continued from page 14.)

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## ALPHABETICAL INDEX TO ADVERTISERS


A

Allan, Whyte & Co. ..... 2
American Zinc Lead & Smelting Co. ..... 10

B

Bath, Henry & Son ..... 13
Balback Smelting & Refining Co. 13
M. Beatty & Sons, Ltd. ..... 16
Beatty, Blackstock, Fasken, Cowan & Chadwick ..... 12
C. L. Berger & Sons, Ltd. ..... 16
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd..... 4

C

Campbell & Deyell, Ltd. ..... 11
Canadian Copper Co..... 6
Canadian Explosives, Ltd. ..... 5
Can. Ingersoll-Rand Co., Ltd..... 1
Canadian Inspection & Testing Laboratories, Ltd. ..... 11
Canadian Laboratories, Ltd. ..... 11
Canada Metal Co. ..... 12
Cohen, S. W. ..... 11
Consolidated Mining & Smelting Co. ..... 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. ..... 13
Curtis's & Harvey .....Outside Back Cover

D

Dept. of Mines, Canada.....Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd..... 9
Dominion Engineering & Inspection Co. . . ..... 11
Dorr Co. . . ..... 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. ..... 11
Fleck, Alex. . . ..... 9
Forbes, D. L. H. ..... 11
Fraser & Chalmers of Can., Ltd. 4

G

Gartshore, Jno. J. . ..... 12
B. Greening Wire Co., Ltd. .....Front Cover

H

Hassan, A. A. ..... 11
Hendrick Mfg. Co. ..... 6
Hersey, Milton Co., Ltd. ..... 11
Heys, Thomas & Son ..... 11
Hitchcock, C. H. ..... 11

I

Imperial Bank of Canada ..... 6
Industrial & Technical Press, Ltd. .....Outside Back Cover
International Nickel Co. ..... 6

J

Johnson, Matthey & Co. ..... 11
Jones & Glassco . . ..... 10

L

Ledoux & Co. ..... 11
Lymans, Ltd. . . ..... 6

M

MacKinnon, Holmes & Co., Ltd... 9
Murphy, Chas. J. ..... 11
Mussens, Ltd..... 10

N

Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

O

Orillia Molybdenum Co. ..... 16
Ontario, Province of .....Inside Back Cover

P

Pacific Coast Pipe Co., Ltd. .... 9

Q

Quebec, Province of ..... 8

R.

Roberts & Schaefer Co. ..... 3

S

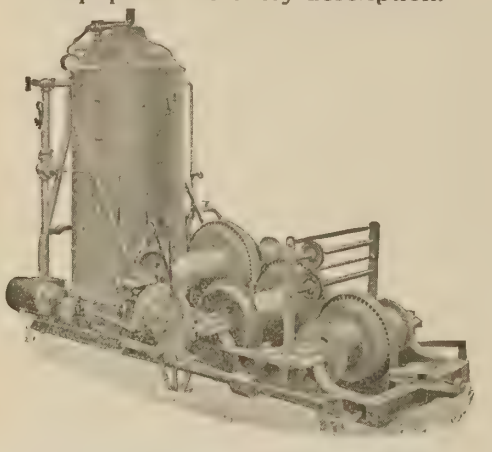
School of Mining..... 9
Segsworth, R. F. ..... 12
Smith & Durkee Diamond Drill Co. . . ..... 12
Smith & Travers Diamond Drill Co. . . ..... 12
Smith, Sydney . ..... 11
Spearman, Chas. . . ..... 11
Sullivan Machinery Co. ..... 2
Summerhayes, Maurice W. ..... 11

T

Temiskaming & Northern Ont. Ry 16
Tyrrell, J. B. ..... 11

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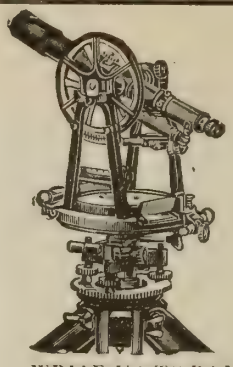
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Annual Report of the Mineral Production of Canada During the Calendar Year 1913, by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

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Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

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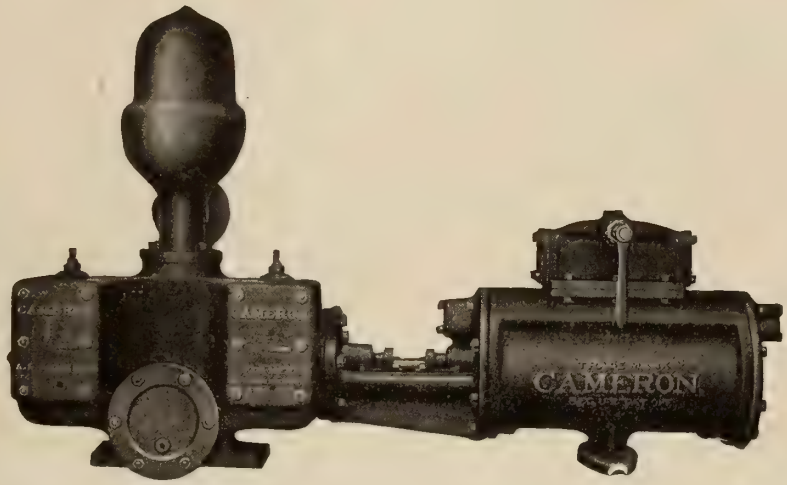
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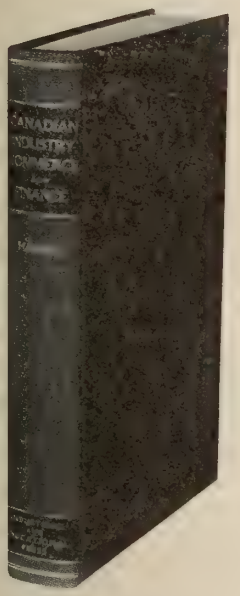
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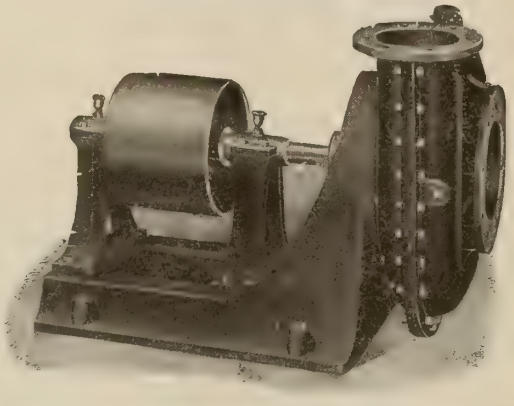
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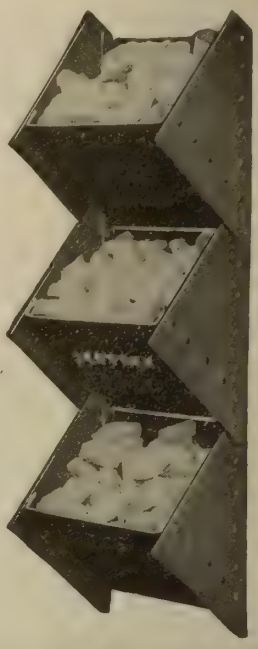
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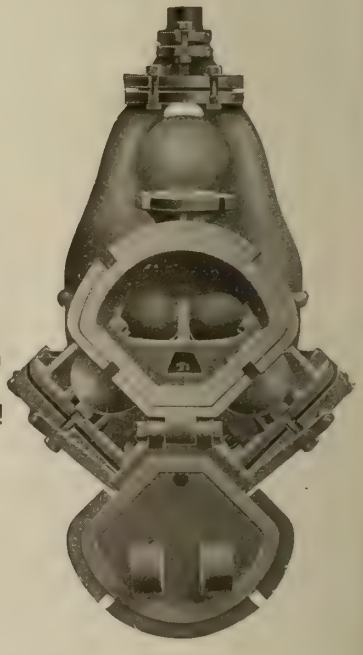
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, August 1, 1916. No. 15

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CONTENTS

| Editorials— | Page. |
|---|---|
| The Deutschland's Cargo | 359 |
| Control of Export of Nickel | 360 |
| Service Recognized | 361 |
| Mining and Smelting at Anyox | 361 |
| The Manigotagan Gold District, Manitoba. By Justin S. De Lury. | 362 |
| A Dredge King of the Klondike. By Frank G. Carpenter. | 366 |
| From Lake Athabaska to Great Slave Lake. By Chas. Counsell. | 369 |
| Concentrating Cobalt Silver Ores by Oil Flotation. By Ben Hughes. | 365 |
| Sulphudizing and Flotation of Oxidized Ores. By D. C. Ralston | 371 |
| The Prevention of Explosions. By James Ashworth | 373 |
| Person and General | 377 |
| Ore Receipts at Trail, B.C. By E. Jacobs | 374 |
| Special Correspondence | 378 |
| Markets. | 382 |

## THE DEUTSCHLAND'S CARGO

The nature of the cargo carried from the United States by Germany's submarine merchantman has been the subject of much interest. It is fair to assume that the cargo indicates the materials most needed in Germany, and it is no surprise to learn that nickel and rubber are among them. Canadians are especially interested in the nickel shipment and its origin.

According to announcements made by the Dominion Government the arrangements made with the International Nickel Company are such that no Canadian nickel can be obtained in the United States by Germany. We interpret the announcement to mean that none of the nickel of Canadian origin refined since the war began is to be obtained by German agents. It is obvious that the Dominion Government cannot have prevented the accumulation in the United States by enemy agents of a certain quantity of nickel which had passed from the hands of the refiners before the outbreak of war. And it is not unlikely that some small quantity of nickel refined since the war began has been obtained by German agents, for some nickel in the United States is not of Canadian origin. But for the Government's assurance we would assume also that some nickel of Canadian origin refined during the war may have been sold indirectly to the enemy, in spite of the fact that the International Nickel Company is making every effort to live up to its agreement.

A rather surprising statement in the "Toronto World" of July 19 casts doubts on the success of the agreement. Under an Ottawa date line appears the following:—

"If the German submarine Deutschland is taking a cargo of nickel back to Germany, it may be Canadian nickel, and the Government has no knowledge that it is not, is the view expressed by Hon. George P. Graham to-day.

"He has just returned from a visit to New York, and while there he met a man who had purchased tens of thousands of tons of nickel from the International Nickel Co. This was refined from Canadian ore, and when he purchased it, no questions were asked him as to the use that was to be made of the nickel nor as to its destination.

"This showed that no care was being exercised by the International Nickel Co. to prevent nickel from falling into German hands, and the assurance given by the Government that care was being taken was not founded upon fact. There has been no official statement yet as a result of investigation made by the Government. There has been only one statement so far. It came

from an official of Hon. Frank Cochrane's department, and was to the effect that if the Deutschland carried a cargo of nickel it would not be Canadian nickel. Mr. Cochrane is supposed to be friendly to the Nickel Trust."

Now the experience of a man who buys tens of thousands of tons of nickel is worthy of some attention. As the world is producing less than fifty thousand tons annually the man referred to must obviously be the chief purchaser of nickel from the International Nickel Company. In fact if he buys very many tens of thousands of tons, at say, $800 a ton, his transactions might be considered of world-wide importance and as the chief factor in the nickel trade. According to the statement attributed to Hon. Geo. P. Graham this nickel king buys without any embarrassing questions as to destination. If the statement is correct what is the meaning of the Government's assurance? If the statement is not correct did a self-styled nickel king delude Mr. Graham, or did Mr. Graham or the World's correspondent incorrectly report the conversation?

In the "Globe" of July 20, under an Ottawa date line, and labelled "Canada Press Despatch," appears the following:—

"In Government circles the statement of Hon. Geo. P. Graham that Canadian nickel can be bought without question in the open market in the United States is challenged. An official statement bearing upon the whole question and giving the views of the Canadian and British Governments is promised within a few days. It is claimed that 240,000 tons of nickel are produced annually in the United States and that the Deutschland's cargo would be obtainable from that source. There is no indication of a change in the Government policy on the question."

The Globe's informant thus credits the United States with a nickel production six times that of Canada. He is evidently about as reliable as the World's correspondent.

In view of the great interest in the nickel question it is to be regretted that mis-statements of fact and unsupported charges are being so readily published in the daily press. An agitation in favor of refining our metals at home and controlling the sale of them is to be commended, but the publication of foolish reports is unpraiseworthy and not complimentary to the character of our daily newspapers.

## CONTROL OF EXPORT OF NICKEL

The war has directed attention to our unsatisfactory methods of marketing products. Our dependence on foreign refineries has been more widely recognized. Nickel has attracted special attention.

The "Toronto World" may justly claim credit for arousing public interest in the nickel question. Since the beginning of the war it has repeatedly drawn attention to the disadvantages arising from depending on other countries for the refining of our matte. The "World" has thus rendered a public service. At the same time, however, there can be little doubt that readers of the "World" have been misled by much that has been printed, for much of it is incorrect. We have found it impossible to agree with the "World" in its suggestions for overcoming what are admittedly conditions unsatisfactory to Canadians.

Early in the war the "World" demanded that the export of nickel matte to the United States be prohibited. This demand appeared to us as not in the best interests of Canada and the Allies, and unfriendly to the United States. Nickel is one of the most important metals in munition manufacture and an abundance of it is especially desirable during the war. Fear that Germany might get a little was justified; but under the agreement made it became obvious that the small amount Germany could get would be as nothing compared with the desirability of furnishing Britain and her Allies with all they required. The "World" therefore received no support from us in its demand for an embargo on nickel matte.

The "World" has repeatedly stated that the International Nickel Company is controlled by Germans. We have, however, no information which would lead us to suppose that such is the case and we incline to the belief that not only is the company controlled by Americans, but also that these much maligned Americans are very well satisfied with an agreement which does not permit them to sell nickel to our enemies. Fear of the present control of the International Nickel Company has therefore not been among our reasons for favoring nickel refining in Canada. We, however, do not overlook the fact that Canada would do well to provide that control of our nickel refineries should never be allowed to pass into German hands.

To our mind the oustanding reason for the location of the nickel refineries in the United States instead of in Canada is that the directors of the company do not think that they would increase their profits by establishing refineries here. As long as it believes that profits should be the only consideration the International Nickel Company may be expected to make no change in the location of its refinery.

During the past two years, however, the company has been given sufficient intimation that a consideration of profits alone will not be tolerated for long. Hasty action which might have proven disastrous to the munitions business and embarrassing to many American manufacturers has happily been averted; but the nickel company doubtless realizes that Canadians intend to control the export of nickel in the future.

The United States is the largest consumer of nickel and will likely prove long to be our best customer. The Americans who control the International Nickel Company have reaped great profits from their enterprise and will doubtless continue to make large profits from the industry for many years to come. Many American manufacturers depend upon Canada for nickel. The

business is very profitable and the demand is increasing, and we may therefore expect no serious setback even if the cost of refining should be slightly increased.

The International Nickel Company has established in New Jersey a refinery which suits its purpose. The investment involved is large and the local facilities for operation are claimed to be the best. To abandon such a plant would doubtless entail considerable loss. Such economic waste should be avoided if possible. A solution may be found in the use of the New Jersey plant for a limited period for refining of nickel to be consumed in the United States. The refining in the United States of the nickel to be used there is not so objectionable as the refining in the United States of nickel for export to Europe.

Canada as the chief producer of nickel should have control of the export trade. To ensure control it is essential that we should have here a refinery of large capacity, preferably of such capacity as to make us entirely independent of other countries. We should place ourself in a position to prohibit re-exportation of Canadian nickel from any other country. We should never again be dependent upon an agreement with a foreign refinery, even though the Government reports the present agreement as satisfactory. We should when desirable be in a position to export nickel only to countries which will guarantee that none of it shall be re-exported.

## SERVICE RECOGNIZED

An event of more than local significance was the celebration in Calumet, Michigan, on July 15 of the semi-centennial of the Calumet and Hecla Mining Company, one of the most successful mining companies in the world.

The Calumet and Hecla Company has always taken a great interest in the welfare of its employees, and endeavored to give them fair wages, pleasant surroundings and excellent facilities for the education of their families. The result has been that many of the employees have spent the greater part of their lives in the service of the company.

In recognition of this long service the company has distributed gold, silver and bronze medals to employees. One hundred and sixty-nine recipients of gold medals have worked for the company for over forty years. Three hundred and seventy-nine men who have served for over thirty years received silver medals. Eight hundred and six received bronze medals in recognition of twenty years of service.

The Calumet and Hecla directors have shown that they have the interests of their employees at heart. That they have succeeded in keeping men in the service of the company for so many yars is an evidence of this fact.

## MINING AND SMELTING ON OBSERVATORY INLET, B.C.

Mr. Arthur Lakes, Jun., of the mining engineering firm of Larson & Lakes, of Spokane, Washington, recently returned to that city from a visit to Observatory Inlet, in Skeena mining division, Cassiar district of British Columbia. A Spokane newspaper recently quoted Mr. Lakes, as follows:"

"It would be a hard matter to find a more prosperous community than that of Anyox, B.C., the Granby Consolidated Co's town on Observatory Inlet and the site of the big smeltery which, by the way, is one of the most complete and up-to-date copper reduction plants in the world.

"The Hidden Creek mine and the Anyox smeltery are both running full blast. The company is making much money, and its employees are getting their share, wages running from $4 to $5.50 a day, the latter rate for miners. Costs of production are being steadily reduced, and the company's officials feel confident that by the time copper prices shall have returned to normal, the cost of their copper laid down in New York will be as low as that of any mine in the United States with the single exception of the Kennecott, in Alaska. Two-thirds of their output of blister copper now goes to New York and the remainder to Montreal.

"Though the mine run of ore averages between 2 and 3 per cent. copper, the company has recently encountered a shoot of ore, of an extent as yet unknown, which thus far averages better than 15 per cent. copper. The company is reported to have optioned and to be prospecting the Big Swede group on one of the Queen Charlotte Islands. This property is said to hold out the prospect of being a big Copper deposit.

"About 13 miles from Anyox, on Alice arm, the Stilwells of Seattle, Washington, are equipping a molybdenum mine with a 50-ton flotation plant, which is expected to begin operations on August 1. This is probably the largest known deposit of molybdenum in the world, and as the ore occurs in quartz its metallurgy presents no problems. The owners have been awarded a contract by the Munitions Board for 100 tons of the metal in concentrate containing not less than 60 per cent. molybdenum at $1 a pound, or $20 a unit. From what I have seen of the ore, I believe they will not experience any difficulty in producing the grade of concentrate required, and they should clean up $200,000 on the contract.

"The Chicago Development company, which is more or less closely allied with the Goldfield Consolidated company, has developed by diamond drilling in the Dolly Varden mine, near the head of Alice arm, extensive bodies of both dry silver and lead ores which they are now opening up with a view to production. They have constructed a fine wharf on Alice arm and are making a 17 mile wagon road to connect with the mine."

## TONNAGE OF THE DEUTSCHLAND

Manifest for the Deutschland entered at Baltimore custom house discloses 3000 cases of dystuffs, an indefinite amount of scrap iron ballast, and states gross tonnage at 771 tons and net as 447 tons. American Consul Fee at Bremen, in granting bill of health, attests to 791 gross tons, but does not declare net tonnage.

If submerging tank cubic capacity is further deducted in calculations, net tonnage may be reduced to a very small amount. Upon this will depend the serviceability of submarines as cargo carriers. If these 300-foot vessels are only capable of carrying 50 or 100 tons net cargo, the enterprise will be considerably curtailed.—The Wall Street Journal Straws.

# THE MANIGOTAGAN GOLD DISTRICT, MANITOBA

## THE RICE LAKE, GOLD LAKE AND LONG LAKE AREAS

By Justin S. De Lury

The Manigotagan district comprises the original Rice Lake and the more lately found Gold Lake and Long Lake areas; it is thought best to use the name "Manigotagan" as "Rice Lake" is properly applicable to only the area adjacent to that lake.

Rice Lake was formerly reached by the Hole River from Lake Winnipeg, but since discoveries have extended the known mineral belt as far south-east as the east end of Long Lake, the Manigotagan River has been most used as a means of access to the district. This is the principal reason for using the name "Manigotagan."

In summer, the country is best reached by taking a large boat from Winnipeg or Selkirk on the Red River to the mouth of the Manigotagan River, up which canoes are taken, the trip from the lake to the mineral belt taking two or three days. The country rises considerably eastward from Lake Winnipeg, and owing to this frequent rapids and falls are encountered. These necessitate many portages, but as most of them are rather short and well-worn they are no great obstacle. Prospective visitors using the Manigotagan route, can reach the Rice Lake and Gold Lake areas by going into Clearwater Lake, by way of a creek and three short portages from a point where the creek enters a marsh on the river about two miles above



**Gold Pan Mine, Gold Lake, Manitoba**

Turtle Lake. Long Lake is merely a wide portion of the Manigotagan River and can be reached by continuing up that stream and making a few portages.

Tyrrell made the first report on the region of which this mineral belt forms a part, but as his work was of the nature of a reconnaissance, his report and map are valuable from the prospectors' point of view, only in that the general geological relations and travel routes of this and the surrounding country are well presented.

Moore and Wallace visited the area in 1912 and Moore issued a brief report* and map which have been of great value to the prospector in indicating the areas of pre-Cambrian non-granitic rocks. At the time of this last visit of the officers of the Canadian Survey, the only prospects in the district were some on the Hole River to the north and west of Rice Lake, others on Rice Lake and some large barren-looking quartz veins on the west end of Long Lake. The writer who has just completed a three weeks examination of three of the more promising prospecting centres, was fortunate in being associated with Professor Wallace of the University of Manitoba, who worked the area with Moore in 1912 and to whom any merit this paper may have is largely due on account of his valuable cooperation.

It was found that the known mineral-bearing belt has extended considerably in the past few years. The gold Lake prospects have been known for some time and more recently the Long Lake area has shown up some good prospects, particularly north of the East End of the lake, and northwesterly from there to Halfway Lake. The latter lake and Gold Lake were not known when Moore's map appeared but the accompanying sketch will give a rough idea of their positions and size. New finds are also reported from the Hole River country but these were not examined.

The topography of the country is similar to that of most parts of the pre-Cambrian areas of Canada. Rounded rock ridges alternate with swamp and muskeg throughout a country well supplied with small lakes and rivers, and thickly wooded with the usual kinds of trees: poplar, birch, spruce, balsam, jack pine, tamarac, etc.,

A glance at Moore's map gives a good general idea of the geological relations of the country. In the accompanying sketch map, no attempt has been made to represent the geological formations; it is presented merely to add some topographic and geologic features not found in Moore's map and to indicate the general locations of the prospect camps referred to in the paper. A broad belt of pre-Cambrian rocks from a few miles to ten or twelve miles in width and from sixty to eighty miles in length extends from the mouth of the Hole or Wanipigon River on Lake Winnipeg in a south-easterly direction. The nature of these rocks is indicated by Moore's classification, given below; the belt is surrounded on all known sides by granites, intrusive at least into some of the formations. The bedding planes of the old sediments and the schistose layers of the more massive rocks are generally near the vertical in position, suggesting that they are the remains in part at least of the synclinal portions of isochinal folds. The strike of these folds is roughly parallel to the lines of contact of the belt throughout the district.

Moore's classification of the rocks of the area is given below, as it indicates in small space the outstanding rock formations of the district and will serve as a basis of reference for some remarks that sollow on the relative ages and structures of some of them:

Port—Lower Huronian?—Manigotagan Series, pegmatite and gneiss.

Huronian?—Wanipigon Series: conglomerate, arkose, graywacke, chert, jasper, gray gneiss and schist.

Keewatin—Rice Lake Series: greenstone, quartz porphyry, rhyolite, trachyte felsite, green and gray schist.

Moore places the porphyry with the Rice Lake Series which is placed provisionally as of Keewatin age. This was done probably from its general close connection with Keewatin greenstone and from the fact that large portions of the porphyry might well appear as probable lava rocks and from the finding of similar rocks as pebbles in the conglomerate. It was found that the poryhyry, and apparently the ore that is general throughout the district is intrusive into the greenstone, and more conclusive still, it was found to intrude sediments which almost certainly belong to Moore's Wanipigon Series, which is regarded as younger than the Rice Lake Series. Thus, the porphyry is, next to the granite, the youngest large formation of the district. It is possible that there are other older and sim-

*Geology of the Shores and Islands of Lake Winnipeg, etc. A. Rep. C.G.S., Vol. XI.
**Region East of the South End of Lake Winnipeg. Summary Rep. C.G.S., 1912.

ilar porphyries in the field but improbable that the main porphyry formation is not part of the same later intrusion.

The relative ages of the formations are fairly well established but nothing in the way of correlation can be attempted until the granites of the country are differentiated and the relations of the different masses with the other rocks are established. All the contacts observed show that the granite is the latest formation of the district. Whether there is an older granite which is not later than some of the pre-Cambrian rocks of the area could not be determined, so that it would not be fitting to attempt to read any of these formations too closely into established pre-Cambrian classifications. There is one important body of granite not indicated on Moore's map and as it is of economic importance it is one of the few purely geological features represented on the sketch map. It contains some of the veins of the Long Lake—Halfway Lake area, where it intrudes greenstone and porphyry on the south west side and greenstone on the northeast side. Near the Moose vein in the Gold Lake area is a similar granite and it may be that the two outcrops belong to the same body.

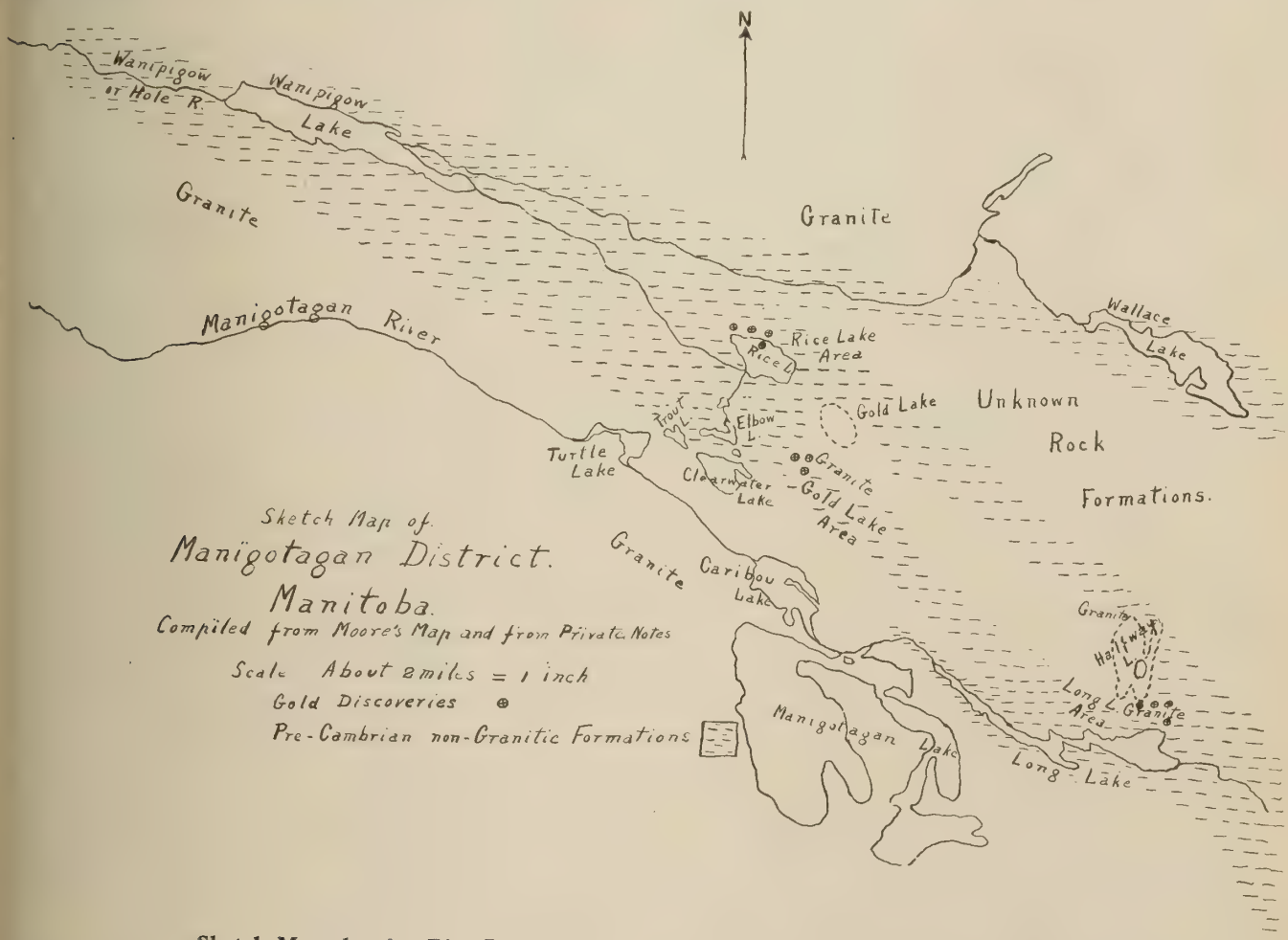
The greenstones of the area show types from fine grained lava showing the pillow-structure to fairly coarse diabase. All of these are more or less chloritic and show various depths of green color, but it is not to be taken for granted that they are all of the same age or are necessarily all Keewatin. The fact that there is one at least basic dyke cutting the porphyry in the Gold Lake area makes the bunching of the basic rocks more uncertain. These statements will at least show that nothing but detailed field work will solve the complex formations and structures of this district, and it is hoped that this will be accomplished during the present summer by the Canadian Geographical Survey party at present in the field.

## The Rice Lake Area.

A brief visit to the Rice Lake area showed little that was not reported by Moore. Since 1912 some shafts have been sunk, but these were unaccessible and as practically no stripping had been done there was little to be seen. It is claimed that rich ore was encountered in several of the Rice Lake properties but the veins seem to be quite irregular, breaking up and pinching out at intervals. Instead of good preliminary surface prospecting, machinery was taken in and the veins were followed or attempts were made to follow them underground. Nothing was being accomplished in this area and the machinery formerly used there has been moved to the Gold Lake claims.

## The Gold Lake Area.

Southeast of Rice Lake is the Gold Lake area, lying between Gold Lake and Big Clearwater Lake. Assessment work has been done on several claims in this area, but extensive development has been done only on three properties: Gold Pan, Gold Seal and Moose.




**Sketch Map showing Rice Lake, Gold Lake and Long Lake gold areas, Manitoba.**

## Gold Pan and Gold Seal.

Shafts were sunk on the two former some time ago and in the spring. Phenomenally rich ore was struck at a depth of about 125 feet in the Gold Pan. The shaft was sunk at a point near where a basic dyke 20 or 30 feet in thickness cuts across the porphyry. Whether this dyke had anything to do with this local high value, as similar dykes are known to have had an effect on enrichment in several Western ore bodies, is problematical. The shafts of the Gold Pan and Gold Seal were inaccessible but the outcrop of the vein could be traced for considerable distances.

### Moose

Lying a short distance to the southeast of these properties is the Moose claim. Here active progress was made in prospecting by a crew of about fifteen men under the able management of Mr. John Redington, formerly of Copper Cliff and Cobalt. A shaft had been sunk over 100 feet and drifts were run each way along the vein.

### Veins of Gold Lake area.

The veins of the Gold Lake area are located in porphyry which is of a fairly acid type grading from a fine grained felsite to coarse quartz and feldspar porphyries. The quartz occupies much-sheared zones in the country rock and while fairly continuous varies considerably in width and massiveness. The width varies from a few inches to about six feet in places, while the vein is occassionally split into several veins by masses of schistose country rock. The veins are close to the vertical in position and strike closely with the schistority of the country rock which in turn is always roughly parallel to the general outcrop of the whole rock formation.

In the country between the east end of Long Lake and Halfway Lake are some veins similar in many ways to those in the Gold Lake area. The most striking difference between the two areas is that some of the more promising looking veins in the vicinity of Halfway Lake are in granite occupying similar sheared zones and resembling very closely in other respects the Gold Lake veins.

In the quartz of the veins of the Gold Lake and Long Lake areas is generally apparent some free gold. Pyrite or chalcopyrite or both generally accompany the free gold and are generally present throughout some parts of the vein. Molybdenite, galena and sphalerite are common associates in small bunches and grains. Calcite was noted in several outcrops; it can generally be found where galena and sphalerite occur, but a direct connection could not be established.

In the Long Lake veins as in those of the Gold Lake area, the position is close to vertical

In both areas, veins have been traced for considerable distances, two of them at least, are traceable for over 2,000 feet, but as the entire length of the veins were in no case stripped and only occassional outcrops occur along the same general strike, this statement is made with some hesitation.

### Possibilities of the District.

Concerning the district as a whole, it may be said that there is a large belt of country throughout which gold is found well distributed in quartz veins and accompanied by sulphides. As a rule there is some mineralization of the country rock and in places, notably in the Rice Lake area, this is quite pronounced. While none of the prospects can yet be regarded as mines, some may yet be producers and the wide distribution of gold prospects augurs well for future prospecting. ' No formation of the district can be said to be the most favored and practically all the large formations may and do carry gold-bearing quartz. If two formations were to be named as the most favorable, they would be porphyry and granite.

There are indications that the Provincial Government is anxious to cooperate to ensure the district a thorough trial and it is anticipated that interest will be evidenced in the construction of a road which will make the country accessible from one of the nearest railroad points.

## WATER POWER RESOURCES OF WINNIPEG RIVER

We have just received a recently issued report of the Dominion Water Power Branch covering investigations o the water power resources of the Winnipeg river, one of the large rivers of Canada. These investigations were commenced about four years ago, under the advice of two prominent consulting engineers eminent in water powe practice, Mr. John R. Freeman of New York, and Mr J. B. McRae of Ottawa, Canada, and have been continuously under way. Mr. J. T. Johnston, chief hydrauli engineer of the Water Power Branch, has had immediat direction of the investigations and is the author of the report. His report is very interesting from both historica and engineering standpoints, and of import in present day consideration of national preparedness.

The Winnipeg river has played its part, and a very important one, in the extension of civilization and the settlement of the west. It was the great highway betweer the head of the Great Lakes and Lake Winnipeg, from which lake radiated the great system of canoe routes, to al parts of the western continent, and by its portages laid the westward route for the Indian, the missionary, the fu trader and the settler.

The engineering and economic aspects of the river fo water power are, however, of predominant interest at the present time, and a cursory examination of Mr. Johnston's report will prove that there is no locality in Canada that is more fortunately situated so far as national preparedness in respect of water power is concerned, than is the province of Manitoba, particularly the city of Winnipeg. Chapte VI of the report covers in detail the comprehensive systen of hydro-electric and power developed by which it is proposed that the power resources of the river will be developed to their maximum advantageous use.

The report shows that there will eventually be as much, i not more power available from the Winnipeg river than i now being developed at Niagara. What this represents to the city of Winnipeg and the province of Manitoba, car only be realized by one who realizes the tremendous import of electro-chemical and electro-metallurgical industries of world wide fame, now firmly established at Niagara, anc by one who has the proper conception of the significance of the use to which Niagara power is now put, through the western portion of the province of Ontario, by municipalities, private corporations, and through the auspices of the Ontario Hydro-Electric Power Commission.

The city of Winnipeg and the province of Manitoba have, therefore in the potential powers of the Winnipeg river, an assurance and guarantee of future industrial commercial and municipal growth, the importance of which is not appreciated.

The investigations of which this report is the result were carried on by the Department of the Interior, primarily for administrative purposes.

## BRITISH AMERICAN NICKEL

The Sudbury Mining News in its issue of July 15 published the following:

When you see such eminent men as V. Hybinette, the noted Sweedish metallurgist of New York, and J. E McAllister, Toronto, one of the principals of the British America Nickel Corporation, and Anton Gromingsoder capitalist of Norway, looking over their property at the Murray Mine, it is pretty safe to conclude that there is something doing, and, while we are not in a position to speak definitely yet, it is taken for granted among several cautious shrewd mining men in Sudbury that all is about ready for operations to begin.

## CONCENTRATING COBALT SILVER ORES BY THE OIL FLOTATION PROCESS

BY BEN HUGHES

It is now quite certain that oil flotation will be one of the standard practices of the Cobalt camp. There is probably no camp in the world, where there is such a diversity of practice as in Cobalt. All or nearly all the mines commenced operations with gravity concentration. Later cyanide was introduced in various forms of treatment and finally oil flotation. The new process as demonstrated by the Callow method has proved a remarkable success at the McKinley-Darragh mill. All the other mining companies in the camp, with the exception of the Buffalo, were waiting until the McKinley-Darragh had demonstrated the profit making character of the process in an actual mill flow. This demonstration is now to hand and every company in camp is experimenting with the process.

From a 9 ounce head the McKinley-Darragh is now getting 1½ ounce tails, and there is little doubt that the tails will be reduced to 1 ounce. At the present time, the product being treated is that which would have gone to the slime tables. These slime tables could not reduce tails below 4 ounces and they often went 5 ounces, so that it is quite apparent that the oil flotation process and the small amount of room it occupies in comparison with other methods also commends itself to all mill men in the Cobalt camp. The McKinley-Darragh will probably regrind the sand tails and treat them with oil flotation, although the profit will be considerably less.

At the Buffalo the process will be more largely utilized than anywhere else in camp. The flotation plant should be connected up with the old mill by the second week in August. This flotation plant will have a maximum capacity of 800 tons a day from the big tailings dump and also from mine ore. Mr. T. R. Jones is also experimenting with a furnace to refine the concentrates. Some difficulty may be experienced in marketing these concentrates and no doubt a slightly higher smelter charge will be exacted, but even then there should be no difficulty in showing a good profit above existing methods.

The Nipissing is now treating the whole of the tails from its all-slime cyanide plant by oil flotation and results are said to indicate a profit per ton which will induce them to keep the plant running and even to increase it.

The Mining Corporation is not introducing the flotation process in their Cobalt Reduction plant. Mr. Fairlie has now almost completed his cyanide mill and within a very short time the Mining Corporatiou will refine all its own bullion. The Mining Corporation has for some time had a cyanide plant for treating the slimes. This plant proved so advantageous to them that it was decided to extend the principle to the whole of the mill. This is now being done.

The one place where oil flotation is definitely superseding cyanidation is at the Dominion Reduction. The Dominion Reduction has been crushing in solution, concentrating, cyaniding the tails and also cyaniding the concentrates. It is now determined to concentrate as before and complete extraction with oil flotation. The oil flotation plant has already been ordered and will be installed with all possible speed.

The National Mines at the old King Edward mill have torn down their little concentrating mill and are erecting in its place an oil flotation plant, with which it is intended to treat the mill tails in and near Cross Lake.

The Beaver has for some time been experimenting with a flotation plant devised by a local metallurgist and half the mill men in the camp are experimenting with flotation

It has undoubtedly been demonstrated already that the process is going to make available large tonnages of mill tailings that have hitherto been lying as waste in the Cobalt camp. This is a new process to date on Cobalt ores and before the limit of its extraction can be known, much further experimentation will be necessary. Thanks to Mr. T. R. Jones and his staff at the Buffalo, a large amount of research work was conducted for the benefit of the camp at large, before any plant was installed at all.

To Mr. Jones also and in a minor degree Mr. Cole, must be credited the present success of the endeavor to get pine oil and other tar products from the pine stumps of the country. There is now no doubt whatever that the superior products of pine oil, creosote and coal tar can be obtained by a simple process from the waste wood products in this part of the country. In view of the very marked demand for pine oil, this is regarded as most important. It is quite realized that before these products can be produced at a profit, a considerable outlay of capital is required and a good organization. Such an organization would insure to the companies using pine oil a regular supply, which would otherwise be a matter of concern, as the demand for pine oil now exceeds all supply and any fresh contracts are made on no very satisfactory terms. The Forestry Department of the Department of the Interior at Ottawa is experimenting with the waste wood products. The Mines Branch is also making investigations.

## FRENCH COMPLEX ORE REDUCTION CO.

The Daily News of Nelson, B.C., on July 8 printed the following:

If the French Complex Ore Reduction Co. can secure the necessary electrical machinery it should be turning out refined zinc at its Nelson plant within two months.

Mr. Thomas French, manager of the company, announced last night that the $40,000 worth of bonds which had been guaranteed by the Provincial Government in order to aid in the establishment of the industry, had been sold at 97. Interest payable is 5 per cent. The price is considered to be a favorable one.

The proceeds of the bonds are now in a bank at Victoria and will be released to the company, in payment for construction work, by the Minister of Finance as the work shall proceed.

This morning Mr. French will leave for Victoria to make the final arrangements for commencing the work. Construction will be begun immediately after his return.

It may take some time to secure the electrical machinery, but Mr. French is hopeful that he will be able to arrange to get it without waiting the usual period manufacturers are now demanding on account of press of orders.

The company will treat complex zinc ores by an electrolytic process which has proved successful under epxeriments. It has secured a power rate of one-quarter cent a kilowatt from the City of Nelson.

Mr. French expects to get an extraction of 90 per cent. of the zinc contents of the ore treated. The lead and silver contents will also be saved and shipped to a silver-lead smeltery.

## EXPLORATIONS ON LINE OF G.T.P.

Mr. W. P. Hinton, traffic manager of the Grand Trunk Pacific Railway when speaking in Vancouver, B.C., of the development that has taken place along the western part of that railway said, in part: It is gratifying to note the extensive exploration work being conducted in the highly mineralized areas of the Skeena and Bulkley rivers, in British Columbia, especially on copper bearing properties. Heavy shipping of copper ore to smelteries is already taking place. There are also several gold and silver mines which will in the near future also furnish traffic for the railway.

# A DREDGE KING OF THE KLONDIKE

BY FRANK G. CARPENTER

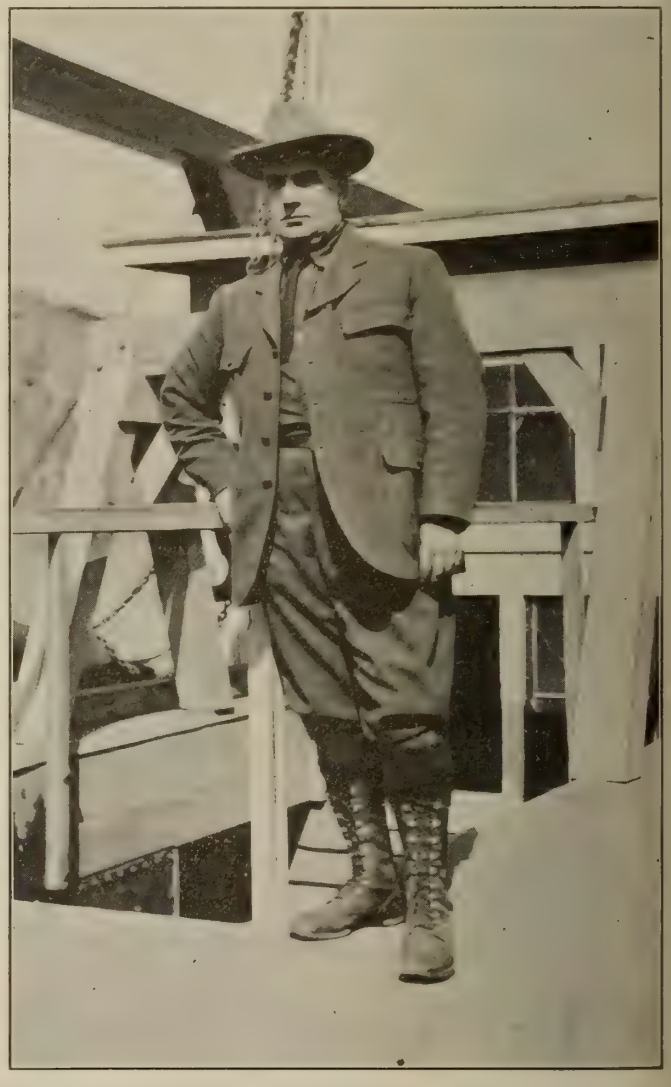
Since I have come to Canada I have acquired a contempt for Aladdin. At every step here I am meeting common, everyday men who are enslaving genii a million times mightier than those of the Arabian Nights. They rub the lamps of their genius and palaces of mechanical wonder spring forth almost in a night. They give their orders and change the course of a river. They raise their hands and valleys are turned upside down. They even send their minions into the stony ice vaults that have been locked since the age of the glaciers to bring forth the gold so long held by Jack Frost.

It is such men who are conquering nature in the valley of the Klondike, who are ripping the skin from the ribs of old Mother Earth and picking out the gold that lies next her bones. I have already written of the Yukon Gold Company, the child of the Guggenheims, which is operating in the creeks that have poured millions into the lap of the world. My subject today is Joseph W. Boyle, the dredge king whose dominions are forty square miles of the gold-bearing earth through which the Klondike itself cuts its way. His territories begin within almost a stone's throw of where the river flows into the Yukon and they run to beyond Hunker creek for a distance of about seven miles. They cover altogether an area of over 25,000 acres, and the most of this is mixed with nuggets, grains, dust and flour of fine gold.

The tract is known as the Boyle concessions. It consists of leases from the government of Canada giving Mr. Boyle the right to work the lower valley of the Klondike up to the crest of the mountains on both sides of the river. The greater part of it is in the wide bed between the hills through which the fast-flowing Klondike runs. At a distance it looks like farm land and when the concessions were granted much of it was covered with gardens. It had all been cleared of woods by the gold hunters of the early days, and a great part of the tens of millions of dollars' worth of gold dust and nuggets that were the first yield of this region came from here. When Mr. Boyle got the property the rich pockets had been practically exhausted. The people declared that all of the gold had been won and that the land would never be fit for anything else than moose pastures.

Mr. Boyle thought otherwise. He reasoned, "if so much gold has come from the valley and the creeks running into it, there cannot but be quantities of gold dust and grains scattered through the bed rock of which the valley is made." He went upon that supposition and got the concessions, and as a result he is potentially one of the very rich men of the world. I do not know just how much gold he has already taken out of the ground, but I understand that the crop of this year will be more than $1,500,000, and that of this more than a million will be profit. Moreover, this sum will all come from gold-bearing earth, which carries values of only about 26 cents to the ton, and which until Joe Boyle stripped off the surface had been locked in the glacial ice that has been in a frozen state for thousands of years. It was the job of Joe Boyle to learn how to work these low values at a profit.

But first let me introduce you to the Joe Boyle of today. "Joe Boyle" is the title by which he goes here. He has no frills about him, and, though every one pays him respect in manner and thought he is as plain as a pipe stem. I wish you could see him. He is the personification of the combative. A giant of a man, he is straight and well formed. He is broad-shouldered, big-framed, stands six feet in his stockings and weighs more than 200 pounds. He has a big head, a broad and high forehead and eyes like blue steel. His appearance is that of a fighter, and it does not belie him. His jaw is of iron and its grip is grim death. He is a positive man. He knows what he wants and how to demand it. He is a good companion and hail-fellow-well-met with those whom he likes. I am told that he is also a good hater and is human throughout. He stands well with his employees, and addresses each of them by his first name. In speaking of him they refer to him as "Joe Boyle" or "J. W. B." but they understand that he is the boss and that everything must be done just as he says.



**J. W. BOYLE**
**Dredge King of the Klondike**

I have spoken of Joe Boyle as looking like a fighter. That is the predominant feature of his character. He has had to fight all of his life, and today he would rather fight than do anything else. He began his fight as a boy. His father was a horse farmer in eastern Canada. He lived at Woodstock, Ontario, and there kept racing stables and bred and raised fine horses. When J.W. B. had reached seventeen this life grew too tame for him and he started out to make his own way. His success was not great, and when a sea captain asked him to go before the mast he became a sailor and as such travelled over a great part of the world. He was wrecked several times, and in

going from the Island of St. Helena around the Cape of Good Hope his ship sprang a leak and the men had to work the pumps for 4,000 miles from there to Bombay. He finally rose to be quartermaster of an English steamer and then came back home.

A little later he struck out for the west, and when some of the first gold mines of the Yukon were discovered he was in Seattle. One of his friends at that time was Frank Slavin, the bareknuckle champion prizefighter of the world. I am not sure, but I think Boyle was Slavin's trainer and manager. At any rate, the two started to Alaska together. They "mushed" it from Dyea over the mountains and got to the Klondike shortly after gold was discovered. Boyle and Slavin worked together for a time and Boyle was afterward engaged in placer mining with Swift-water Bill. "Swift-water" made several fortunes which he frittered away. Mr. Boyle was superintendent of his mines.

Joe Boyle was twenty-eight years old at this time. He was not doing as well as he hoped at his mining, and he conceived the idea that there was a fortune to be made in the earth after the miners had left, and also in the timber that then covered a great part of the Klondike valley. It was as far back as 1899 when he stood on a little hill above the Klondike river and debated as to the size of the tract he would lease. He determined to take all of the land within sight, and then made out the papers for the gold territory which he now has.

He also made a claim for the timber. The latter was ten miles in length, extending through and beyond the territory which he is now mining. Every one laughed at the mining property, but he had to fight for his timber. As soon as his application was known his competitors at Dawson saw the authorities and had them require him to stake out the whole ten miles of his property. This was when the claim was just on the edge of being perfected, and the announcement was made at 3 o'clock in the afternoon before the last day required. Boyle started on foot that afternoon and tramped all night, blazing his way and marking the limits. He had to wade through swamps, blaze the trees and drive stakes. The work was exhausting, but he kept on until he thought he had marked out not less than fifteen miles. He got back to Dawson at 9 o'clock the next morning only to find a number of men ready to jump his claim if it had not been staked. When the claim was measured according to law; it was found that his stakes fell short only twenty feet of the ten miles allotted. After that he started saw-mills. He got $100 a thousand and made money out of his lumber and wood. He has now from this same claim the timbers he uses in his dredging operations, and has a sawmill connected with his electric plant at North Fork, where lumber is sawed by electricity.

It was his lumber profits that gave Mr. Boyle the money that enabled him to go to see capitalists and finance his mining concessions. He first formed an alliance with the Rothschilds, by which he was to have one-third and they two-thirds of the stock. The understanding was that they were to furnish the money, amounting to some millions, and that Mr. Boyle was to manage the property and superintend its developments.

Then the Rothschilds tried to squeeze out "J. W. B." They questioned his title and planned a reorganization. Joe Boyle carried the matter to Ottawa and fought them in the courts, where he finally got a judgment against them for more than $600,000. The Rothschilds wanted to get rid of him, and offered him a million dollars for his share of the stock. He refused and in return made them an offer of $400,000 for the two-thirds that they held. At first they laughed, but they finally reconsidered and accepted his proposition. Mr. Boyle then formed another company known as the Canadian Klondike Mining Company, by which name the property is known to this ay.

I have already given you the extent of the Boyle concessions. They include seven miles of the mile-wide Klondike valley and they run to the crest of the hills on each side. The whole territory contains more or less gold. Mr. Boyle tells me that 150,000,000 cubic yards of it has already been prospected and proved, and that there is probably 100,000,000 yards more. This makes a total of 250,000,000 cubic yards, the most of which is yet to go through the great dredges, and in addition there are forty or fifty millions yards of gold-bearing gravel that will be sluiced down the hills by the hydraulic giants.

Mr. Boyle says that the bed of the valley contains about 26 cents' worth of gold to the cubic yard and that it costs on the average about 8 cents a yard to get the gold out. At this estimate the gold in the valley amounts to somewhere between forty and fifty millions of dollars.

This vast sum is free gold in the shape of flour, dust and small nuggets scattered through the earth in such infinitesimal quantities that the output of a wagon load is not as big as a pinch of your fingers. The most of the gold lies as far from the surface of the earth as the height of a three or four story house, and with the exception of a foot or so of moss and muck on the top the material consists of gravel, the stones ranging in size from bowlders of quartz and granite as big as a peck measure down to pebbles the size of a pea and even fine sand. In many places this material under the moss is frozen as though it were one great block of ice, the bowlders, pebbles and sand being cemented together more tightly than the nuts in peanut brittle, and in this frozen mass is found the gold.

In the rich creeks where the Guggenheims have been operating the earth carries values to the amount of 60 or 70 cents worth of gold to the ton. It pays to thaw the ice out by steam, but this can be done only at a cost of about 30 cents to the ton. In the Boyle concessions, where the earth carries only 26 cents' worth of gold, some other method of thawing had to be found, for the steam-point process would cost 4 cents more per ton than the possible output. Mr. Boyle studied the problem and decided to make the sun and the river do his work for him. He found that if he could get rid of the muck and the moss, the great non-conductor that covered the frozen mass, the sun would gradually make its way down to bedrock. It would thaw the earth to a depth of ten feet in the summer and the next winter's freezing would make solid only about six feet of this thawing. He found that when the next summer came the sun would poke its rays through the six feet of the ice made in the last winter and then jump through the thawed ground left from the last summer and melt four or five feet more of the ancient ice strata below. In short, if the moss could be taken away, the sun would melt its way to bedrock.

Then came the question how to get the muck off at a price that would pay. Here the forces of nature about him were again brought to bear on the question. He found that the Klondike itself would serve for this job. All that he had to do was to dam it in places and turn the course of the river this way and that. The current soon washed off the moss and the muck and when turned again left the gravel just right for the work of the sun.

The next process was to handle the melted material with such economical machinery that not an ounce of energy or a cent of expense went to waste. He investigated the subject of dredges and had some of the largest of these machines that have ever been built made for the purpose. He experimented and had them made better and better. He then brought them in pieces by sea to Skagway and carried them over the mountains and down the Yukon to Dawson and put them to work. His dredges

each cost in the neighborhood of a half million dollars apiece and he has three of them, which are now lifting up the bed of the Klondike valley and turning it, as it were, upside down. The dredges gouge out the earth to a depth of thirty or forty feet, taking up rock of all sorts, from bowlders as big as a half-bushel basket to earth as fine as the flour of which mushroom crackers are made. They lift this stuff in great steel buckets at a ton to the bucket, to the height of a six-story house, and pour it through revolving screens, so that the rock, gravel and sand are carried away, and every bit of the gold is caught in layers of cocoanut matting not unlike that used on an office room floor. At the close of each twenty-four hours the mats containing the gold are lifted out and washed in a tub. The gold and black sand fall to the bottom and the mats are put back again.

This, in brief, is the way Joe Boyle mines gold. It is only in brief. It gives no conception of the mighty dredges and the other machinery used in the handling. I despair of describing the dredges. Each is as big as a seven-story block. It is 130 feet long and sixty feet wide, and it weighs 2,000 tons. The machinery is of manganese steel, although this is inclosed in a woooden framework made on the ground.

This giant is moved by electricity. The falling water from the mountains twenty miles off gives it its power, and makes it work as though it had brains. It is the nearest live thing I have ever seen in machinery. It has two great legs at the back with which it walks, as it were up the valley, gouging out its pathway and carrying the pond of water in which it swims with it as it goes. Each of the legs is a square tube of steel which weighs thirty-two tons. It runs to the top of the dredge and at the bottom ends in a steel point which is dropped far down into the bed of the river. With this as an anchor the dredge swings around as though on a pivot, digging out the thawed earth in front of it and cutting a swath two feet in depth around an arc 300 feet long. When this has gone down to bed rock it moves a little and sinks its other leg into the earth and thus cuts another two feet, swinging back and forth until all the earth in front of it down to bed rock has passed through the dredge. At the same time the debris is carried away on a steel framework by a moving belt at the back much like the chaff and straw of a threshing machine. This debris consists of boulders and gravel which are piled up in a ragged path of desolation behind.

Each of these dredges will handle 500 tons of rock in an hour and keep up that average all the day through. It will handle 12,000 cubic yards in a day, or one or two million cubic yards in a season. The three dredges now working will actually handle more than 6,000,000 cubic yards of such material this year, or enough to fill a train almost as long as the distance around the earth. One day's output of a single dredge would comprise 12,000 loads of a ton and a half each, and if put upon wagons with the noses of each team of two horses resting on the tail-board of the wagon in front, the wagon train would be sixty miles long. Each wagonload would contain 26 cents' worth of gold, and of that about 18 cents would be profit. This seems very little as to the individual ton, but it amounts all told to more than a million dollars a year.

## MANITOBA'S MINERALS

Charged with the mission of reporting on the economic possibilities of Manitoba, particularly with regard to its mineral wealth, ProfessorR. C. Wallace, professor of geology at the University of Manitoba, and J. S. De Lury, lecturer on geology at the University, will leave Winnipeg shortly and proceed to the mine fields of The Pas, and spend three or four weeks in the mining area of this northern district. From there they will proceed to other parts of the province, and will investigate districts particularly in eastern Manitoba.

The two geologists are working under the public utilities commission for the provincial government, and by their efforts the university is thus assisting the province in arriving at an estimate of the mineral resources of Manitoba. They have recently visited the Rice Lake area.

"Quite favorable," is Prof. Wallace's summary of the prospects of Manitoba in regard to the gold mining industry. He claims that what is needed is the inducement to the province of a larger number of good prospectors. "I have faith in the prospectors already here," he added, "and some of them are doing extremely good work."

Turning to his forthcoming trip to The Pas, the professor said: "One must not forget that the district north of The Pas is figuring to-day more extensively in mining literature than any other part of the province. There as a large bed of ore there which is being diamond drilled it the presen t time, and if the ore continues to any depth there is a likelihood that there will be a large mine there soon."—Manitoba Free Press.

## STAKING CLAIMS IN MANITOBA

Commenting on the mining regulations in the North West The Pas Herald says:

The one-line staking law should be abolished, and four lines and four posts substituted, as the one line is a very poor method, and, especially so after the writing on the posts becomes unreadable. Then it makes it impossible to ascertain how much ground a man has on each side of his line. In the Beaver lake section to-day there are hundreds of claims that show a blazed line and not one word of the inscription readable.

## GRANBY CONSOLIDATED CO.

Commenting on the earnings of the Granby Consolidated M.S. and P. Co. during the fiscal year ended June 30, and more especially during May, the Wall Street Journal states that "by the middle of July the Granby Co. will have cash and copper in sufficient amount to at once retire all its outstanding bonds. The company does not owe a dollar, there not being any loans against its copper holdings."

The estimated earnings of the company for the eleven months ended May 31, according to the same authority total $4,500,000, and for the full year ended June 30 more then $5,250,000, the earnings of May alone being stated as exceeding $800,000.

"Granby Co's operations in the last year," continues the Journal, have shown results far exceeding the hopes entertained for the property by its most optimistic friends. The new smeltery at Anyox has given, and continues to give, an excellent account of itself, and the plant has got down to an operation basis where economies planned for it demonstrate their worth.

"Development has been carried on at the Hidden Creek mine and it is understood new tonnage will have been added to ore reserves by the next annual report shall be published. At the Midas mine, in Alaska, much development work has also been accomplished, and shipments of ore from that property to Anyox will constitute a factor in Granby Co's production this summer."

The company's May output of copper, 4,727,929 lb. was the largest monthly production ever turned out by the company. Of that quantity, 3,383,230 lb. was contributed by the Anyox smeltery, while the Grand Forks plant produced 1,344,699 lb.

# FROM LAKE ATHABASKA TO GREAT SLAVE LAKE

BY CHARLES CAMSELL

During the summer of 1914, an exploration was carried out in the hitherto unexplored region lying between Athabaska and Great Slave lake and east of Slave river. The expedition was undertaken with the object of obtaining as much information as possible on the geography, topography, geology, and natural history of a region that had previously been visited by only one man who had left any written record of his journey. That man was Samuel Hearne, an officer of the Hudson's Bay Company, who crossed the region in company with a band of Chipewyan Indians in the winter of 1771-72 as he was returning to Fort Churchill from his voyage of exploration to the Coppermine river.

The exploration carried out by the writer consisted of a single canoe traverse across the region from south to north leaving Lake Athabaska at a point a few miles west of the mouth of Charlot river and entering Great Slave lake at the mouth of the Taltson river about 40 miles east of the mouth of Slave river. Parts of the route are traveled by the Indians that live and hunt in the region, but the whole route is apparently not known to any single individual, and there are certain parts of it that have never been traveled by any one of the present generation. As a result it was found impossible to get any native to accompany the expedition in the capacity of guide and the route was followed with the aid only of a rough sketch drawn by an Indian, and in which there were many blanks.

Though a period of five and a half months elapsed from the time the party left Ottawa on May 5 until its return no October 18 only about 2 months of this time was actually employed in geographical and geological investigation of the field, the remainder of the time having been taken up in travel to the point of starting on Lake Athabaska, and from the point of completion of field work on Great Slave lake.

Our course to the point on the north shore of Lake Athabaska where exploration actually began followed the usual boat route from Athabaska, at the end of the railway-line, down the Athabaska river to its mouth and thence northeast for about 100 miles on Lake Athabaska. The return journey from Resolution, on Great Slave lake, was made by way of Slave river to Lake Athabaska and thence by the Athabaska river to the point of starting at Athabaska.

The unexplored portion of northern Canada, exclusive of the islands of the Arctic, is embraced in a number of blocks of territory marked off from each other by the travelled routes of explorers. The largest of these blocks has an area of about 75,000 square miles and the total number of those over 5,000 square miles in extent is about twenty-five. The aggregate area of all the unexplored blocks is over 850,000 square miles or about one-fourth of the total area of continental Canada.

One of the largest of these unexplored blocks is that across which our traverse was made. It covers an area of about 53,000 square miles and extends in a north and south direction from Athabaska lake to Great Slave lake and Hanbury river, and in an east and west direction from Slave river to the Thelon and Dubawnt rivers. It embraces the whole of the basin of the Taltson river and the headwaters of the Thelon river. It includes the extreme northwest corner of the province of Saskatchewan and the northeast corner of the province of Alberta, but the greater portion of it is in North West Territories, beyond latitude 60 degrees north.

From Edmonton, which is a convenient starting point for expeditions into that northern country, the region may be reached by either of two routes. One follows the course of the Athabaska river for 430 miles, to Lake Athabaska, and the other lies over the new Edmonton, Dunvegan, and British Columbia railway to Peace River Crossing and thence follows the Peace river to Athabaska lake.

The only means of entering this unexplored block of territory in the summer and of travelling through it, is by canoe, and there are several Indian canoe routes leading into it from points on Athabaska lake, Slave river, and Great Slave lake. Most of these routes lead to a point on the edge of the Barren lands near the headwaters of the Taltson river, which has been a rendezvous for many years for the Indians of Forth Smith, Fond du Lac, and Resolution, during the autumn hunting season.

The chief results of the expedition into the region north of Athabaska lake were the carrying of a survey across an unexplored block of territory 53,000 square miles in extent; the exploration of two streams previously unexplored, the Tazin and Taltson rivers, for a distance of about 290 miles; the exploration of a number of lakes, ranging from 15 to 30 miles in length, along the course of these rivers; and **the location of a number of belts of the older, pre-Cambrian, stratified rocks, in which minerals of economic importance may occur.**

The Taltson river drains practically the whole of the country between Athabaska and Great Slave lakes, east of Slave river to the 108th meridian. Its main tributary is the Tazin, which drains the region immediately north of Athabaska lake, while the Taltson river itself carries the water from the region between the east end of Great Slave lake and latitude 61 degrees, its headwaters interlocking with those of the Thelon river.

Neither the Tazin nor the Taltson can be considered navigable for large boats, except in short stretches, and steamers could only ascend the Taltson river from Great Slave lake for a distance of 23 miles, to the first falls. Falls and strong rapids occur at frequent intervals and in our descent of the two rivers it was necessary to make about forty portages, the longest one mile in length, and to run dozens of rapids.

The basin of the Taltson river lies entirely within the Laurentian Plateau region, and its physical features of land and water are characteristic of the great region that comprises the northeastern part of the continent of North America. It is a country, when viewed on a large scale, of moderate relief and rounded outline, but in detail it is rugged, broken and rocky. It abounds in lakes, and its streams flow in ill-defined and irregular valleys, rarely more than 100 feet deep.

The highest elevations in the region are on the immediate shores of Athabaska lake where the hills rise somewhat abruptly to a maximum height of about 700 feet above the lake or about 1,400 feet above the sea. From there, the surface slopes gradually and regularly, northwest, to Great Slave lake. In consequence of this general character of the region the height of land betweeen Athabaska and Great Slave lakes lies about 3 miles north of Athabaska lake and the average slope of the upper level of the plateau from there to the mouth of Taltson river at Great Slave lake is about 5 feet to the mile and presents no decided break at any point.

The Taltson river flows northward to Great Slave lake following the slope of the land surface; but, like most rivers in the Laurentian Plateau region, it has no well defined valley nor has it an evenly graded profile. It is characterized rather by a succession of level stretches and short, sharp falls. Here and there, for considerable

*Extracts from a report on an Exploration of the Tazinand Taltson Rivers, North West Territories, Geological Survey of Canada.

distances, its valley is well defined and regular: but more generally, it flows from one expansion to another through narrow, gorge-like openings at which there are as a rule direct falls or strong rapids. For the greater part of its course it flows through a rocky country, on which there is little or no soil; consequently, there are few gravel beaches and the river itself is clear and carries no sediment. Within 30 miles of Great Slave lake, however, it enters an alluvial plain which has been built up in the past by Slave river and is a part of the ancient delta of that stream. Here, the river cuts a shallow valley in the old delta deposits, exposing sections of sands and silts.

The country abounds in lakes, all of them remarkable for the clearness of their water and the beauty of their surroundings. The largest of these are: Tazin lake, 29 miles long and 8 miles wide, Hill Island lake, about 24 miles long and 2 miles wide, Tsu lake 17 miles long, and Thekulthili lake, a lake which we did not thoroughly explore, but which is at least 25 miles long. They are all rock basins, with irregular shore-lines and few beaches.

Over the greater part of the region the bed-rock has no covering of soil nor loose material. Here and there sand-plains or patches of boulder clay occur; and, towards the mouth of the river, the bed-rock is covered by sediments from Slave river. On account of the lack of soil there are no possibilities for agriculture even if the climate were more temperate. The forest trees are small and stunted and no commercial timber, other than pulpwood, occurs anywhere in the whole region. The principal trees are spruce, Banksian pine, poplar, barch, and tanarack.

The lakes and streams abound in fish, including whitefish, pike, suckers, and lake trout. Game, however, is scarce except in the winter season when caribou come into the region in great numbers from the Barren lands. Besides these, there are a few moose and black bears. All the fur-bearing animals common to the Mackenzie River are found here.

The country is inhabited by Indians known as Caribou Eaters, a branch of the Chipewyan stock, who trade at Fort Smith. A few other Indians, also, from Chipewyan, Resolution, and Fond du Lac hunt over parts of it.

The **commercial possibilities of the region** are small and it is not likely to support any population except, possibly, such as might be engaged in mining pursuits. Agriculture is out of the question and unless economic minerals are found in it, it will always remain unsettled. So much of this block of territory remains to be explored that it is impossible to say, yet, what it may contain in the way of minerals. Quartz veins were noted in the Tazin rocks in several places, notably at Hill Island lake, a region which it might be worth while to prospect. These veins may possibly prove in places to be gold-bearing.

All the solid rocks of the region are of Pre-Cambrian age. The oldest rocks encountered are a series of schists, quartzites, conglomerate, narrow beds of limestone and argillite, and some volcanic rocks, all classed together under the name Tazin series. They occur in several isolated bands which trend northwest to north and are entirely surrounded by granite or gneiss. These bands are merely remnants of a once more widespread series of rocks which were reduced in area by the intrusion of the granites and by erosion. They are economically the most important rocks met with since they are cut by a number of quartz veins which may contain some of the precious metals. These bands of Tazin rocks are the areas to which prospectors should devote their attention in prospecting in the region.

The Tazin rocks are everywhere intruded by granites and gneisses of a great, composite batholith, which covers 86 per cent. of the country along the route of our traverse. Granites and gneisses of different ages are here grouped together, but some of the massive varieties are clearly younger than the gneissic. The trend of the gneiss is mainly north and south, conforming to the trend of the rocks in the Cordilleran region rather than of those in eastern Canada.

No imformation is available with regard to the climate of the region traversed except that obtained during the months of July and August from our own observations. During these two months the prevailing conditions were bright, warm days and cool nights. Storms of wind or rain were infrequent and the rainfall was so light as to interfere very little with the progress of the work.

The maximum temperature recorded at noon was 86 degrees F. on July 25. Frost was not noted until September.

The four factors which influence the climatic conditions in this region are: (1) the warm winds from the west; (2) the presence of the two large bodies of water on either side, namely, Athabaska lake on the south and Great Slave lake on the north; (3) the cool winds coming over the Barren lands from Hudson bay on the east; and (4) the absence of soil or other loose material on the bed-rock over a great part of the region.

Ice remains in Athabaska lake until the middle of June and in Great Slave lake somewhat later, and no doubt has the effect of retarding the advance of the spring; particularly in the country bordering these lakes. The proximity of the Barren lands on the east and of Hudson bay has a similar effect, so that spring is much later in this region than in the same latitude farther west, towards the foot of the Rocky mountains. These two factors so counteract the effects of the warm winds from the Pacific as to produce, also, a somewhat lower average temperature throughout the year than that which prevails in the same latitude farther to the west.

Judging by information obtained from the natives, the precipitation of rain and snow is very much the same as it is at Chipewyan where the average rainfall for the year is about 15 inches and the snowfall 4 feet.

It appears that the winter temperatures are not too low to permit of people living in the region with some degree of comfort. The chief drawback to travel and residence in the region are the myriads of mosquitoes in the summer months. These pests are in such numbers in the months of June and July, and in the early part of August, that some protection from them is absolutely necessary when travelling either through the woods or on the lakes and streams.

The lakes and streams of the region abound in fish, but the variety is not great. Nearly all the larger lakes contain lake trout and whitefish. Pike, suckers, and loche are found nearly everywhere in the rivers. The inconnu and rayling are caught in the lower part of the Taltson river below the last falls, but so not ascend to the upper parts of the stream.

## THE QUEEN GROUP

In connection with a report that the Queen group of gold mines, in Sheep Creek camp, Nelson mining division of British Columbia, Northwest Mining Truth" says: "The Queen group is equipped with a 20-stamp mill. The Queen mine has been developed to a depth of 700 ft. On the the lowest level the drift is 20 ft. wide and the average value of all the ore of that width mined for more than 100 ft. in length was $9.50 a ton. The saving made on the amalgamating plates is about 60 per cent. of the gold. much of the remainder is contained in concentrate from the tables, which is sent to a smelting works. There is a large accumulation of tailing which it is expected will pay well when treated by cyanidation or flotation. The Queen group includes the Queen Yellowstone and Alexandra mines. Ore of good grade has also been developed on three levels in the Alexandra.

# SULPHIDIZING AND FLOTATION OF OXIDIZED ORES

BY O. C. RALSTON AND GLEN L. ALLEN

Flotation of oxidized minerals depends upon a preliminary "sulphidizing" by any method that will convert at least the surface of the mineral particles to a sulphide of the metal. This step is followed by flotation of the "artificial" sulphide, which results in a concentration of the metallic values in the low-grade oxidized ore being treated.

The methods of sulphidizing that have been investigated by the U.S. Bureau of Mines in cooperation with the department of Metallurgical Research of the University of Utah are as follows:

Sulphidizing (1) by the use of hydrogen sulphide on either the dry or the wet crushed ore, (2) by the use of solutions of the various sulphides and sulpho-compounds of sodium, (3) by the use of solutions of the various sulphides and sulpho-compounds of calcium, (4) by the use of sulphur vapor, (5) by the use of a sulphureted oil, (6) with colloidal sulphur.

It has been found that treatment by some of these methods will form a film of sulphide over the surface of the particles of such minerals as lead carbonate or copper carbonate, whereas in other cases the mineral particles are sulphidized to the core. Other methods failed to give any results.

All of the above methods of sulphidizing have been tested on a great number of carbonate-of-lead ores. Some of these ores contained silver and some contained lead as the principal metal. A number of the ores have been successfully concentrated and others refuse to yield to concentration by flotation. In general, a high alumina content (acid soluble) in an ore seems to prevent the application of sulphidizing and flotation.

In sulphidizing with hydrogen sulphide gas, as applied to the lead carbonate ores, it was found that the best method of applying the gas to a dry powdered ore was in a tumbling barrel with the gas inlet in the end. Sulphidizing in a glass bottle showed that the ore blackened quickly after the application of the hydrogen sulphide gas. On attempting to float out lead sulphide from the ore as soon as it had blackened it was found that a low extraction of lead was obtained and likewise a low-grade concentrate, unless the pulp was previously acidified with sulphuric acid. By acidifying the pulp, cleaner concentrates were floated but the extractions of lead remained low. Only by prolonged treatment with hydrogen sulphide gas could the extraction of the lead be raised to commercial grade. With a number of ores eight hours' treatment gave an extraction of over 80 per cent. of the lead.

The use of hydrogen sulphide was considered for the reason that it can be generated quite cheaply. With iron matte available at $5 to $10 per ton, and sulphuric acid at from $5 to $10 per ton, the cost of the hydrogen sulphide resulting, including labor, etc., is between $30 and $50 per ton. If this gas in combining with the metal in the ore produces only a superficial film of sulphide, and does not penetrate to the center of the particles, it might be possible to make a ton of the gas sulphidize many tons of ore.

Unfortunately hydrogen sulphide attacks the metallic particles of the ore with such avidity that by the time the latter are sulphidized sufficiently to permit of good extraction by flotation, they have also been sulphidized to the core and practically a chemical equivalent of hydrogen sulphide, to the lead in the ore, has been absorbed. Even coarse pieces of ore in a bottle absorb the gas with evolution of heat, and on breaking open the pieces the black coloration is seen to have traveled deeply into the particles.

Owing to the fact that the value of the lead concentrate obtained is very low as compared to the amount of hydrogen sulphide necessary to sulphidize it, this process is not regarded as commercially practicable.

Application of hydrogen sulphide to the ground ore suspended in water does not seem to be subject to the same difficulty. True "filming" of the particles with a film of lead sulphide seems to take place, and the extractions possible after a short treatment with the gas are satisfactory. The speed of travel of molecules of hydrogen sulphide gas, as compared with the speed of travel of the same molecules in solution affords an explanation of the difference in the action of the gas when applied to dry pulverized ore as compared to its action when applied to pulp suspended with water.

The best results on lead carbonate ores have been obtained when sulphides of sodium were used for the sulphidizing agent. The sodium sulphide must necessarily be introduced in solution and seems to cause true filming. The sulphides of sodium considered commercially applicable are the normal sulphide of sodium, $Na_2S$, sodium polysulphides, $Na_2S_4$ and $Na_2S_5$, and the sulphhydrate of sodium, NaSH. Of these, the latter, the sulphydrate, seems to be very effective, as is evidenced by the quicker blackening of the pulp, and the deeper, blacker color formed. The normal sulphide is almost as effective; the polysulphides seem to be the least active. Different ores require 10 minutes to 24 hours of contact with the solutions of sodium sulphide used, depending on the properties of the ore and on the strength of the solution of sodium sulphide. Amounts of sodium sulphide varying from 10 to 20 pounds per ton of ore are usually sufficient, and should be applied to pulp containing about one ton of water per ton of ore, in order that the solution may be as strong as possible during the sulphidizing stage of the process. After a good black color has developed and the color has ceased to increase in blackness, the pulp is diluted with water to a 3: 1 or 4: 1 mixture and floated in either mechanically agitated or pneumatic machines. The market for sodium sulphide is limited and it should be obtainable at considerably less than 2 cents per pound.

The polysulphide of calcium, obtained by boiling powdered sulphur with slacked lime, seems to be satisfactory for ores that yield easily to sulphidizing, but is sluggish in its action, as compared to the sulphides of sodium. The normal sulphide of calcium is only slightly soluble and hence its use was discontinued as a possible sulphidizing agent. The sulphhydrate of calcium is the most active of these agents, but has not been tested to any extent in this work, as there is doubt as to whether it would be commercially feasible to prepare such a compound.

Sulphidizing with sulphur vapor has been tried with little success, for the reason that it must be applied at a temperature above the boiling point of sulphur in order to prevent condensation of the sulphur. This means that the ore must be heated to a temperature above 445°C. There seems to be no difficulty in obtaining elemental sulphur vapor commercially, as pyrite will give up half of its sulphur content when heated in a closed space, and sulphur dioxide gas can be reduced to elemental sulphur by passing it through a heated zone in the presence of a reducing agent. As lead itself is easily reduced from its carbonate form, the temperature might as well be raised to the point where the lead can be liquated out, a reducing atmosphere being used instead of a sulphidizing atmosphere.

The use of a sulphureted flotation oil, in which loosely combined sulphur is available for combination with cabonates of lead or other metals, and the rest of the oil is then available for "oiling" the artificial sulphide, has

given very little encouragement in the tests conducted by the bureau.

Finally, colloidal sulphur, mentioned as a possible method of sulphidizing, does not seem to combine with lead carbonate at all. It floats as a white lining of the air bubbles in the flotation machine, and brings up very little lead with it.

Usually the precious metals contained in a lead carbonate ore accompany the lead. The writers have noticed that the silver extraction will lag behind the lead extraction when the ore is sulphidized with sodium sulphide, and that the reverse has usually been true when hydrogen sulphide was used.

### Oxidized Copper Ores

Many attempts have been made, both by large operating companies and by other experimenters, to float the carbonate and other oxidized minerals of copper. For that reason the testing of such ores by the writers has been limited.

Hydrogen sulphide seems to be by far the best medium for sulphidizing oxidized copper ores previous to flotation. When applied to the dry ore, the writers found the same conditions as those mentioned for lead; the particles are sulphidized to the center, which requires an excessive amount of hydrogen sulphide. Applied to wet pulp, the hydrogen sulphide seems to cause true filming. The writers' work has yielded black concentrates, but they are informed by Mr. Callow, of the General Engineering Co., that the company has been able to reduce the amount of sulphur used to a point where the froth is green with slightly coated malachite. He states that as little as one-half pound of sulphur per ton of ore is giving good extractions in the plant of the Magma Copper Co., at Magma, Ariz., where his company has put in the first successful installation of this kind.

Sodium sulphide has been tested by a number of the larger companies who have some oxidized copper minerals in their sulphide ores. The amount of oxidized copper in such ores is usually a fraction of one per cent., so that two or three pounds of sodium sulphide per ton of ore are all that is necessary. This is usually added to the machines during flotation, or to the mixing tanks before flotation. The writers' experience is that if some little time of preliminary contact is allowed before flotation is attempted, better sulphidizing of the material will result.

Calcium polysulphide has been used for some time in a number of the large copper concentrating mills with indifferent success, and seems to be detrimental in some instances. On the ores tested by the writers fair results were obtained if the calcium polysulphide was allowed to act until the ore had become well blackened.

It is stated that sulphur vapor was tested at one of the large plants for flotation of oxidized forms of copper and gave better results than any other method of sulphidizing. Of course this method has the disadvantage of having to be applied to dried, heated, and finely divided ore.

Sulphureted oils are being used at a number of plants to supplement other methods of sulphidizing and considerable secrecy is observed as to the technical details of this work.

So far as the writers know, colloidal sulphur does not assist in the flotation of oxidized forms of copper. Neither has the silicate of copper been successfully floated by sulphidizing flotation. It will blacken when sulphidized, but resists flotation. Possibly it still presents a silicate surface, rather than a sulphide surface to the flotation elements. For this reason a number of the large copper companies are seriously contemplating leaching the oxidized copper ores, rather than lose what silicate of copper may be present.

Repeated attempts to float the natural sulphides along with sulphidized minerals have failed, as the sulphidizing agents cause trouble with the flotation of the natural sulphides. By careful adjustment this difficulty has been solved in one plant, though the details are not available.

### Ozidized Zinc Minerals

Attempts to float the oxidized particles of zinc from their ores, both before and after sulphidizing by most of the above methods, have met with no success whatever in the laboratory experiments of the writers. They are informed that some headway was made with the problem by Prof. Traphagen, at the Colorado School of Mines, but that the sulphide film seemed to come off too easily. However, poor results were obtained, whatever the cause.

The writers' experience has been that most of the carbonate ores of zinc contain important amounts of the silicate, and this may be one reason for the nonsuccess of this work, for the same reasons that copper silicate will not float.

Direct flotation of oxidized minerals of the kind mentioned, so far as known, has not been successfully accomplished. In all of the successful work witnessed by the writers there has been some form of alteration of the oxide to the sulphide. A number of parties claim to be successful in the flotation of copper carbonates without sulphidizing, and others in the flotation of scheelite, fluorite, and magnetite, The authors were unable to verify these statements.

Concentration of natural sulphide ores by the flotation process has met with such success that attempts have recently been made to apply the process to the flotation of ores other than natural sulphides.

As inquiries on this subject are frequently received by the U.S. Bureau of Mines, it has been thought best to publish a summary of the results so far obtained from the experimental work on oxidized ores at the Salt Lake City station of the bureau, in cooperation with the department of metallurgical research of the University of Utah. The work has been directed by O. C. Ralston, assistant metallurgist of the bureau, and was carried on for the most part by G. L. Allen; N. C. Christensen and R. W. Johnson also assisted with the work.

As above stated, this paper is only a summary, or a preliminary report of the experiments on the flotation of oxidized ores. More complete details as regards the flotation of carbonate ores of lead will be given by the writers in a paper on that subject.

## ENLARGING ZINC REFINERY

The Daily News, Nelson, B.C., on July 10 printed the following among other mining news: Extension of facilities for the manufacture of refined zinc at the electrolytic plant at Trail smeltery includes the construction of a new building 140 by 200 ft. Work was begun last week with a gang of 56 steel workers. About 270 tons of steel will be used. The output refined zinc is to be increased from 15 to 30 tons a day.

## SHIPMENTS FROM KOOTENAY

Published figures show Kootenay, B.C, shipments of zinc ore and concentrate during the month of May to have been as follows: From Sullivan mine, Kimberley, 4798 tons; Galena Farm mine Silverton, 702 tons; Standard mine, Silverton, 904 tons;Lucky Jim mine, Zincton, 596 tons; Utica mine, Adamant, 30 tons; total, 7030 tons. The ore from the Sullivan mine went to the Consolidated Mining and Smelting Co's reduction works at Trail, B.C.; the product from the other mines was shipped to United States Smelting Works.

# THE PREVENTION OF EXPLOSIONS IN COAL MINES

## NOTES ON MR. WILLIAM SHAW'S PAPER ON "COAL DUST, HOW IT AFFECTS THE MINES OF THE CROW'S NEST PASS"

BY JAMES ASHWORTH.*

"The paper on "Coal Dust" presented at the meeting of the Rocky Mountain Branch of the Canadian Mining Journal, may be best treated by taking up Mr. Shaw's conclusions one by one:—

I,—"Adopt the panel system"—The paper being unaccompanied by plans or diagrams makes the conclusion under this head far from convincing as to any advantage which may accrue outside the division of a mine into districts as is already compulsory under the Mines Regulation Act. The division of one coal mine in South Wales into panels did not save the lives of the men in any panel.

(2),—"Leave solid barriers of coal between lifts,"—The above remarks re plans will also apply to this conclusion.

(3),—"The driving of a dip entry for an intake airway." This conclusion does not call for remark but it is good advice.

(4),—"The Enlarging of cross cuts between chutes,"—The reasons for this conclusion are certainly NOT obvious without further explanations and diagrams. To enlarge cross cuts must mean a very much higher cost for air stoppings and brotticing.

(6),—"Do not allow the removal of bodies of gas during the time that the majority of the workmen are in the mine, whether or not the mine be dry and dusty."

Surely the provisions of the Mines Regulations Act, General Rule 8 B.C. Act, and the Special Rules cover this suggestion and make it compulsory.

(7),—"The installation of a water spraying system or, where that is not possible, the installation of inert barriers in all roads leading from the dry and dusty section to other sections of the mine."

The water spraying suggestion calls for the first notice, as Mr. Shaw has in the body of his paper shown that this system is a positive impossibility in the icy cold mines of the Crows Nest Pass at the time of the year when it is assumed that water in some form would be the most necessary. It seems curious under such conditions that he should recommend it as a "practical" alleviation. The writer has for many years endeavoured to show that water vapor in any form cannot restrain an explosion, and he finds Mr. Shaw confirming this, by stating that not leess than 30% can restrain the extension of an explosion what 30% means will be realized when the writer also adds that it is impossible to charge the air with more than 5% of water vapor, and then only when it is in the form of steam, and further that the highest explosive effects of a mixture of explosive gas and air is only attained when 5% of water vapor is present in the air. The futility of depending on any sort of spray or moistening of the air of a mine, as a safety precaution is thus proved and has now been acknowledged by the U.S. Bureau of Mines. In the early part of his paper Mr. Shaw states that "the air entering these mines in winter shows a relative humidity of from 45% to 50%; the return air from the same mines shows a relative humidity of from 90% to 100%; therefore, the mines are more dry and dusty in winter than during any other season of the year. This, then, is the season when danger is most extant."

It is particularly misleading to make these statements in "percentages of humidity," because the low heat of the intake air say 10 degrees may be saturated by only 0.8 grains of water vapor, and yet this represents 100% humidity, whereas air at 70 degrees would carry 8.0 grains and also give 100% humidity. Consequently when statements are made in per centages of humidity they do not convey any practical fact, and yet it would be fair to argue that 0.8 grains of water vapor per cubic foot when present in the ventilating air current of a coal mine provides as great a factor of safety (if there is any safety from damp air), as if the air carried ten times that weight of water, viz. 8.0 grains. Most people will say that such a conclusion is absurd, and so it is, yet both air currents would be saturated.

In Mr. Shaw's seventh conclusion, he also introduces the question of "inert dust barriers,"—this is the latest of the so-called preventatives against the extension of an explosion flame, from whatever cause it originates, and is designed to "make safe" the use of explosives in dusty gaseous coal mines. Mr. Shaw says truly in his 5th conclusion that the best prevention is "the elimination of explosives in the blasting of coal."

The writer might leave the subject at this point but for the fact that the majority of operators, officials and miners, have no real desire to shut out blasting, and therefore this suggestion of inert dust barriers needs to be discussed as carefully as the watering or so called humidity cures.

The whole of the possible success of the "inert shale dust" cure depends on one factor in the proposition, viz, does the sound wave or air wave, caused by the initiatory explosion precede the flame of the explosion. If it does not, then the flame will have passed before the safety shelves are thrown over, and consequently when the shelves are thrown over it is too late to arrest the flame. The velocity of the flame of an explosion may be 3,000 feet per second, or more, and in this regard Mr. Shaw has said, in his second paragraph, that 0.19 ounces of fine coal dust per square foot on the sides of the roadways is sufficient to propagate an explosion, it becomes clear that a much less quantity in the air current is sufficient, whereas those who think that a cloud of fine dust is necessary base their arguments on what Col. Blackett has called the "pioneering cloud," and there are a large number of people who think that it is impossible to have coal dust explosion without a so-called pioneering cloud of dust being first formed. If this cloud of dust did precede the flame throughout, then the flame would be choked by the excess of dust. Mr. Shaw ventures the opinion that the force of an explosion takes the centre of the road on which it is travelling and doubtless it does fill the whole of the roadway, but the flame effects are most frequently and principally demonstrated on the upper half of the roadway. Although Mr.Shaw seems to be of opinion that water spraying has the advantage over the inert dust cure, yet he goes on to say, that water spraying could only be adopted during 8 months of the year, and therefore during the other four and driest, what he considers the most dangerous time of the year, inert stone dust would have to be used. If inert dust will arrest the propagation of a coal dust explosion flame it ought to be still more effective in preventing the origination of an explosion. Further it is assumed, that a considerable percentage of fire damp is present, then neither inert dust nor water spraying would be effective.

Mr. Shaw does not explain what is covered by the word "gas"—This however is a very important point because it has been absolutely proven by analyses that the gas of Crows Nest Pass mines is not necessarily methne only, but a mixture which often contains ethane, and sometimes

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sulphuretted hydrogen and the writer believes also free drogen also.

The presence of these gases renders "firedamp" moore dangerous than when it consists of methane only. The "greasiness" of some of the Crows Nest Pass coal dust is another noticable feature.

Mr. Shaw's final conclusions, which read as follows, may be taken together,—viz, No. 8,—"That the very careful attention of all mine officials be directed to the ventilation and presence of gas, and dry coal dust in the mines." No. 9,—"That the officials of all the mines should make an effort to enlist the co-operation of their workers, and the worker should endeavour to co-operate with the officials in these important matters which so vitally affect the safety and welfare of all concerned."

Acts of Parliament and Special Rules, have been put into force to both officials and miners to do their duty, and yet we continually find when investigating the cause of mine disasters that some one, through what has been called the fallibility of man, has taken a chance" which ended disastrously.

The four main preventatives of explosions are,— (1) to abolish blasting in coal with either Nonobel No. 1, or any other explosive,— (2), to use no electricity for any purpsoe inside a dusty fiery mine,— (3), not to carry very high pressure air in pipes into the mine,— (4), where possible adopt some form of longwall working.

# ORE RECEIPTS AT TRAIL, B.C.

BY E. JACOBS.

Ore receipts at the Consolidated Mining and Smelting Co's reduction works at Trail, British Columbia, during six months ended June 30, 1916, compare favorably in total quantity with those of the corresponding periods of the years 1914 and 1915, respectively. There is a slight difference in the number of days in the several periods under notice, since the figures for the 1916 period are to June 30, inclusive, while for 1915 they include one day in July and for 1914 two days in that month, but these differences do not materially affect the totals for comparative purposes. However, taking the actual number of days the several periods cover, it is found that the average quantity of ore received daily during the 1914 period of 183 days was 1002 tons, that for 182 days in the 1915 period 1196 tons, and that for 182 days of 1916 1349 tons a day. The totals for the several periods were as under:

DURING PERIOD ENDED

| FROM | July 2, 1914 Tons | July 1 1915 Tons | June 30 1916 Tons |
|---|---|---|---|
| **East Kootenay—** | | | |
| Fort Steele div. | 10766 | 21642 | 36872 |
| Windermere div. | ..... | ..... | 137 |
| Golden div. | ..... | 33 | 85 |
| Total | 10766 | 21675 | 37094 |
| **West Kootenay—** | | | |
| Ainsworth div. | 10167 | 2924 | 7969 |
| Slocan div. | 10875 | 2385 | 7261 |
| Nelson div. | 14076 | 1831 | 1511 |
| Trail Creek div. | 127925 | 172856 | 172816 |
| Trout Lake div. | 30 | 56 | ..... |
| Revelstoke div. | ..... | ..... | 415 |
| Total | 163073 | 180052 | 189972 |
| **Boundary—** | | | |
| Grand Forks div. | 120 | 170 | 239 |
| Greenwood div. | 40 | 258 | 75 |
| Total | 160 | 428 | 314 |
| **Yale** | | | |
| Kamloops div. | ..... | 228 | 2690 |
| Yale div. | ..... | 8 | 41 |
| Total | ..... | 236 | 2731 |
| **Cassiar—** | | | |
| Omineca div. | 806 | 101 | 257 |
| Total from British Columbia Mines | 174805 | 202492 | 230368 |
| **Alberta** | ..... | 10 | 52 |
| **Ontario** | ..... | ..... | 39 |
| **United States** | 8667 | 15125 | 15007 |
| Total from all sources | 183472 | 217627 | 245466 |
| **Summary—** | | | |
| From Consolidated Co's mines | 145341 | 196116 | 205201 |
| Custom ores | 38131 | 21511 | 40265 |
| Total of receipts | 183472 | 217627 | 245466 |

DETAILS OF ORE RECEIPTS IN SIX MONTHS OF 1916.

| | Tons | Tons |
|---|---|---|
| **East Kootenay—** | | |
| Giant, Golden | 20 | |
| Monarch, Golden | 65 | |
| Lead Queen, Windermere | 137 | |
| Park Group, Fort Steele | 12 | |
| St. Eugene, Fort Steele | 422 | |
| Sullivan, Fort Steele | 36438 | 37094 |
| **West Kootenay—** | | |
| Ainsworth div.— | | |
| Bluebell, Riondel | 3556 | |
| Comfort, Riondel | 84 | |
| Cork-Province, South Fork | 6 | |
| Crescent, Coffee creek | 28 | |
| Florence Co., Princess creek | 656 | |
| Gallagher, above Ainsworth | 21 | |
| Highland, Cedar creek | 917 | |
| Martin, South Fork | 30 | |
| No. 1, above Ainsworth | 2381 | |
| Utica, Adamant | 290 | 7969 |
| Slocan div: | | |
| Apex, New Denver | 26 | |
| Comstock, Four-mile creek | 13 | |
| Galena Farm, Silverton | 642 | |
| Hewitt (Silverton Mines) | 258 | |
| Idaho-Alamo, Howson Creek | 27 | |
| Jo Jo, N. Fork Carpenter Creek | 7 | |
| Lucky Thought, Four-mile creek | 260 | |
| Molly Hughes, New Denver | 26 | |
| No. 1 | 26 | |
| Noonday, Cody creek | 121 | |
| Rambler-Cariboo, McGuigan | 906 | |
| Reco, above Cody | 70 | |
| Ruth-Hope, Sandon | 407 | |
| Slocan-Payne, Sandon | 31 | |
| Slocan Star, Sandon | 560 | |
| Standard, Four-mile creek | 3716 | |
| Wonderful, above Sandon | 71 | |
| Yakima, above Sandon | 22 | 7189 |

| | | |
|---|---|---|
| Slocan City div: | | |
| Black Prince | 28 | |
| Enterprise, Ten-mile creek | 29 | |
| Meteor | 15 | 72 |
| Nelson div: | | |
| Emerald, Salmo | 436 | |
| Eureka, Eagle creek | 509 | |
| Granite-Pooman, Granite | 117 | |
| Hudson Bay, Deer Creek | 112 | |
| Molly Gibson, Kokanee Creek | 72 | |
| Perrier, near Nelson | 29 | |
| Queen, Sheep Creek | 228 | 1503 |
| Arrow Lakes div: | | |
| Millie Mac | | 8 |
| Trail Creek div: | | |
| Centre Star group, Rossland | 93918 | |
| Josie group, Rossland | 8247 | |
| Le Roi, Rossland | 70580 | |
| Velvet, near Rossland | 71 | 172816 |
| Revelstoke div.: | | |
| Lanark, Illecillewaet | | 415 |
| **Boundary—** | | |
| Grand Forks div.: | | |
| Emma, Denoro | 213 | |
| Golden Eagle, North Fork | 26 | 239 |
| Greenwood div.: | | |
| Kokoma | 5 | |
| Sally, Beaverdell | 70 | 75 |
| **Yale—** | | |
| Ashcroft div: | | |
| Storm, Highland valley | | 41 |
| Kamloops div.: | | |
| Fog Horn, North Thompson river | 52 | |
| Iron Mask, Coal Hill | 2597 | |
| Pot Hook, Coal Hill | 41 | 2690 |
| **Coast—** | | |
| Omineca div.: | | |
| Silver Standard, near Hazelton | | 257 |
| **Alberta—** | | |
| Yellow Jacket, Lake Louise | | 52 |
| **Ontario—** | | |
| Tip Top, Kashahowe | | 39 |
| **United States—** | | |
| Washington: | | |
| Ben Hur, Republic | 2099 | |
| Knob Hill, Republic | 1577 | |
| San Poil, Republic | 5419 | |
| Tom Thumb, Republic | 267 | |
| Edwards, Valley | 13 | |
| Bonanza, Evans | 345 | |
| Delphia, Danville | 29 | |
| Lead Trust, Northport | 9 | |
| Norman Mines, Northport | 528 | |
| United Copper, Chewlah | 5007 | 14793 |
| Idaho: | | |
| Green Monarch | 15 | |
| Keystone | 126 | |
| Sand Point M. & P. Co. | 5 | |
| Venezuela | 35 | |
| Lakeview | 33 | 214 |
| Total receipts | | 245466 |

The greater part of the increase in East Kootenay in the first half of 1916 as compared with the two other years was from the company's Sullivan mine, from which 10,063 tons was received in the corresponding period of 1914, 21,642 tons in that of 1915, and 36,438 tons in that of 1916. The increase this year would probably have been greater but for the fact that flood waters prevented receipt of the usual quantity of ore, only 420 tons having reached Trail during the last nine days of June as compared with 1903 tons a week which had been the average for six immediately preceeding weeks. The Giant, Lead Queen, and Park group, were new, though but small, shippers in 1916.

Ainsworth division of West Kootenay made an increase of 7,045 tons in 1916 as compared with the first half of 1915, in which latter period the adverse effects of the European war on the metal markets were still being experienced. The first half of 1914, however, saw a production frnm Ainsworth Mines 2290 tons greater than that of 1916. The chief decreases in 1916 were of 1616 tons from the Consolidated Co's Highland mine and 914 tons from its No. 1 mine. New producers were the Florence Mining Co's Hope group with 656 tons, and the Comfort, Crescent, Gallagher, and Martin with much smaller shipments.

Slocan district also made a generally similar recovery from the effects of war troubles, its 1916 total of 7261 tons being 4876 tons greater than that for the corresponding period of 1915. While the comparison with the first half of 1914 shows a decrease of 3,614 tons, it is but fair to point out that shipments of zinc ore to the United States were considerably higher in 1916 than in 1914, so that were complete returns available it would most likely be found that there was little, if any, decrease in total quantity of output for the first half of this year as compared with that of two years ago. Further, flood waters practically stopped the shipment of ore during the latter half of June of this year. However, the chief cause of the decrease was the considerable reduction in the output of silver-lead ore from the Standard mine, the figures for which for the 1916 period were 3716 tons compared with 7677 tons for that of the 1914 period due in large measure to the fact that the production of zinc concentrate was pushed latterly so that advantage might be taken of the high price obtainable for spelter. Several Slocan mines that shipped in 1914 were not on this year's Trail list, namely, the Eastmont, Ottawa, Richmond, Eureka, Surprise, and Van Roi, of these the Ottawa is resuming production, and the Surprise will do so as soon as its new concentrating mill shall be completed. The Galena Farm, Noonday, and Wonderful were new shippers together with two or three others that each sent out a smaller quantity of ore.

The small tonnage of ore received this year at Trail from mines in Nelson division, as compared with 1914, was due chiefly to the suspension of production at the Silver King mine shortly after the outbreak of the war, for while receipts at Trail from that mine totalled 10,803 tons in the first half of 1914, there was not any production at all in 1915 or 1916. Again there was 2579 tons of lead ore received in the 1914 period from mines in the neighborhood of Salmo, as compared with only 548 tons this year. Then the Yankee Girl at Ymir shipped ore to Trail in 1914 but not any this year. On the other hand the Eureka with an output of 509 tons of Copper-gold ore and the Granite-Poorman group with 117 tons of gold concentrate are among the gains for 1916.

Total shipments to Trail from Rossland mines, while practically the same in the first half of 1916 as in that of 1915, compare favorably as between 172,816 tons in 1916 and 127,925 tons in 1914. The chief increase was made by the Le Roi, with 70,580 tons in 1916 against 35,284 tons in the corresponding half of 1914, while the Centre Star

group shipped 93,918 tons in the former period against 81,825 tons in the latter. There was a falling off in the total from the Josie group (Le Roi No. 2, Ltd.), the 1916 amount having been 8,247 tons against 10,778 tons to July 2, 1914.

The only other districts in the Province calling for comment are the following: In Revelstoke division, the Lanark, at Illecillewaet, which made several small shipments late last year shipped 415 tons of silver lead ore this year; the Emma, in Boundary district, after several years of inactivity, last May shipped 213 tons to Trail; the Iron Mask, near Kamloops, though hampered by flood troubles in the latter part of June, reached a total of 2597 tons received at Trail to June 30 of this year as compared with 1946 tons for the whole of 1915, and there were two new small shippers—the Fog Horn and the Pot Hook—also from Kamloops division. Receipts from Omineca division, in the Coast district, were 257 tons this year, against 101 tons in the first half of 1915 and 806 tons in that of 1914. Although not connected with ore receipts at Trail, it should be borne in mind that the comparatively big production of copper ore in Boundary district is smelted at local works to the extent of approximately 5000 tons a day, and that about 6000 tons of gold ore is milled monthly at the Hedley Gold Mining Co's 40-stamp mill, in Similkameen district.

Ore receipts from mines in Washington and Idaho—the latter in but small quantity—were 15,007 tons this year against 15,125 tons for the first half of 1915 and 8,667 tons for that of 1914. Latterly, the Ben Hur, Lone Pine, and Surprise mines, in Republic camp, Washington, have been off the Trail list, but large increases from the San Poil, Republic, and the United Copper, Chewelah, have almost offset those losses.

Altogether, the outlook is favourable for a still further total increase in the ore receipts at Trail, consequently it is to be expected that there will be a gradual enlargement of output of refined gold, silver, lead, copper, and zinc.

## McINTYRE PORCUPINE MINES

Under date of July 21, President Alex. M. Hay issued the following memorandum of production and development of the McIntyre properties for the quarter ended June 30, 1916.

McIntyre Ore: tons milled 30,452; value per ton $8.29; gross value $252,530.35; recovery $241,650.05; Operating costs $128,847.36 or $4.23 per ton; operating profit $112,802.69. Profit from Milling Custom Ore and from subsidiary Company operations was $9,262.15. Total $122,064.84. There was treated 3,721 custom ore.

During the period, Crosscut No. 1001 on the 1,000 ft. level, from McIntyre Extension Main Shaft to No. 5 Shaft was completed, and raising operations to connect the Workings with No. 5 on the 700 ft. level are now under way On the Boundary Vein on the 1000 ft. level about 150 ft. of drifting has been done. Box holes have been cut and stopes started at a height of 18 ft. above the level, both on the property of this Company and on McIntyre Extension ground. In the drifts East and West schist inclusions were met with, reducing the grade of ore. Above the level, however, in the new stopes, the vein is of an average grade of $13.00 and varies in width from eight to twenty-five feet.

At No. 5 shaft, drift No. 714 has been advanced 225 ft. East of 7D Crosscut, and has maintained the same high grade of ore as was shown at the point of intersection.

No. 4 shaft has been sunk to a depth of 800 feet, where a Station is being cut, and it is expected that Mining operations will be commenced on the 700 and 800 ft. levels early in August.

The McIntyre Jupiter Mines began Mining operations early in May, and are now delivering about 65 tons of ore per day to the McIntyre Mill.

The McIntyre Extension Mines have now commenced Mining operations, and deliveries of ore from this source have begun.

In order to increase the settling capacity of the Mill, extra tanks have been ordered, and the necessary additional construction is now under way. This addition will increase the capacity of the Mill to 500 per day. While deliveries of material, etc., are uncertain, it is expected that the addition will be completed by the middle of October.

In order to facilitate the conduct of operations, the question of consolidating the three Companies has been under consideration. With this object in view, arrangements are being made for an independent examination of the three properties, and should the Directors agree upon a basis for such consolidation, the terms will be submitted to the Shareholders for thier consideration and approval.

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The Petroleum Review, London, in its July 8 number has the following:

"In view of the ever-increasing demands for the products of crude oil, one wonders when the extraordinary rich oil shale deposits in the Dominion will be operated in a manner their contents deserve. Year after year the output of crude oil in Canada registers a decline, and this in spite of the fostering care of the Dominion Government which has for years past granted a bounty upon every gallon of crude oil produced at home. Last year, for instance, according to the preliminary report issued by the Canadian Department of Mines, the total output of crude oil in the Dominion was only 215,464 barrels (this excluding Alberta), and its value is given as $300,572. Thus, in spite of increased prices for crude oil during the past twelve months, the value of Canada's oil output for 1915 is the lowest yet recorded. Surely it is time that attention were paid to Canada's oil shales, and their commercial exploitation! The wealth of oil content is beyond question, for the shales are in many places far richer than those now so successfully operated in the Midlothians, while the distribution over large and well-placed areas renders their exploitation one of comparative ease. Our own opinion is that, with a little enterprise, the oil shales of Canada can prove themselves to be well worthy the serious attention of our largest oil-producing companies."

## M. C. M. REUNION.

The 1916 reunion of the Michigan College of Mines will be held at the College, Houghton, Mich. on Aug. 8, 9 and 10.

The executive committee is inviting all former students, graduate and non-graduate, and every former member of the college staff. Owing to the mailing list not being perfect, especially with reference to non-graduate students, some may not receive the formal invitation. It is the wish of the committee that all should attend.

Mr. James Fisher is secretary of the committee and will be pleased to send information about the Reunion.

## HUDSON BAY ZINC.

A late reprt from the Hudson Bay zinc mine, near Salmo, Nelson mining division, is to the effect that work on the 300-ft. level continues to develop ore in both directions and that to the southward, in new ground, especially large and fine orebodies are being found. Taking into consideration the work done on both 300 ft. levels the indications are now that the ore shoot will prove to be about 2000 ft. in length.

## PERSONAL AND GENERAL

Mr. A. D. Little, formerly of Boston, Mass., who is organizing a natural research department for the Canadian Pacific Railway Co., when in Vancouver, B.C., early last month had a conference with Hon. Lorne A. Campbell, Minister of Mines for British Columbia.

Mr. W. Clayton Miller, consulting engineer for the Cassiar Crown Copper Co., left Spokane, Washington, on July 7 for Telkwa, Omineca Mining division of British Columbia, to visit the companies mining proerty in that neighborhood and to advise as to further development of it.

Mr. Alex Smith, one of the owners of the Surprise Silver-lead-zinc mine, situated above Cody, Slocan, B.C., has returned to that district after an absence of three months spent in Ontario and New York.

Mr. J. A. Poyntz, for several years in charge of the development of the Utica mine when Mr. Chas. F. Caldwell, of Hases, B.C., was at the head of that enterprise, is now superintending the further development of the U. S., Bell, and other zinc mines, also situated in central Slocan, near the dividing line between Ainsworth and Slocan mining divisions. The Jackson, U. S., and Bell are among a number of well-known mining properties in Jackson Basin about half a dozen miles south of Whitewater, in which Mr. Caldwell has succeeded in interesting mining men resident in Spokane and other United States cities.

Mr. W. Munroe Archibald, one of the Consolidated Mining and Smelting Co's mining engineers, has returned to Trail, B.C., after having visited mining properties in the neighborhood of Hazelton, Omineca mining division of that province.

Mr. S. S. Fowler, of Riondel, Kootenay Lake, B.C., general manager of the New Canadian Metal Co., was on the Coast early in July obtaining material to repair drainage done by floods in June to the Bluebell mine and concentrating mill water-supply line.

Professor Arthur Lakes was last month visiting at the Lucky Jim zinc mine, on the Kases & Slocan Railway, B.C. His son, Mr. Harold Lakes, is superintendent at the Lucky Jim.

A press despatch from Edmonton, Alberta, published July 4, stated that the Alberta Government had appointed Corporal MacAskill, a returned soldier, formerly of the Edmonton 9th Battalion, who had been invalided home and discharged, to the position of superintendent of the Mine Rescue Station at Lethbridge, Alberta. Corporal MacAskill is an experienced miner.

Mr. Ben Hughes, Editor of the Northern Miner and special correspondent at Cobalt for the Canadian Mining Journal is going into training for the front in a few weeks Mr. Richard Pearce will succeed Mr. Hughes as editor of the Northern Miner.

Mr. John Redington is at Gold Lake, Manitoba. He is manager of the Manigotogan Mining and Development Company.

Mr. Ralph Scott is in Toronto.

Information has been received in Victoria, B.C. to the effect that Major Edward C. Musgrave, who was in England when the war broke out and quickly obtained a captaincy in the King's Royal Rifles, had been awarded the D.S.O. decoration. Major Musgrave was well known on Vancouver island, where he was for several years superintendent of the Tyee Copper Co's Tyee mine on Mt. Sicker, the largest and most productive metal mine on the island. After resigning his position with the Tyee Copper Co., he was for a time engaged in mining in the United States and went thence to Mexico, in which latter country he was a mine manager until times became troublous, when he returned to British Columbia, and later went thence to England. Major Musgrave is a graduate of the Royal Military College, Kingston, Ontario, at Queen's in which place also he took a course in mining engineering before entering upon his mining career in British Columbia. Of three brothers, one who was a successful mine manager in Mexico is this year doing field work for the British Columbia Department of Mines, and another has had years of successful practice as an assayer, for some time in British Columbia and afterward in Mexico.

The Sullivan Machinery Company of 122 So. Michigan Ave., Chicago, and Salisbury House, London, England, has established an agency in Holland with Messrs. Petrie & Co. Heerengracht, 141-145 Amsterdam as its special representatives. Messrs. Petrie & Co. will sell the Sullivan Air Compressors, Rock Drills, Hammer Drills, Diamond Core Drills, Quarrying and Coal Mining Machinery in the Netherlands. This new arrangement replaces the Sullivan Machinery Company agency previously at the Hague.

## ZINC PRODUCTION AT TRAIL, B.C.

Reports from Trail, B. C. according to a western newspaper indicate that the new electrotype reduction works forming a recently added department of the smelting plant of the Consolidated Mining and Smelting Company of Canada, Ltd., is proving an economic success. Mr. James Breen, when travelling to Spokane in company with Mr. F. M. Guernsey, who had just resigned the position of superintendent of the electrolytic zinc plant to join the staff of the Gunn-Thompson interests in Nevada under the general managership of Mr. W. H. Aldridge, formerly managing director of the Consolidated M. and S. Co., was informed by Mr. Guernsey that the plant was now turning out daily 16 tons of electrolytically refined zinc and was headed toward a production of 25 tons a day. When Mr. Breen inspected the plant a few weeks ago its output was in the neighborhood of 10 tons daily.

Another indication of the success of the electrolytic zinc works is the announced intention of the Consolidated M. and S. Co., which some months ago took over the entire capital stock of the West Kootenay Power and Light Co., to add to that company's plant at Bonnington Falls, on the Kootenay river below Nelson, B.C., a unit having a capacity of 6000 horse-power. While there has been a general improvement in the mining situation in the Kootenay district of late and consequently a considerable increase in the demand for electrical power, the requirements of the mines would not consume sufficient current to necessitate such an addition. It is to be presumed, therefore, that the current to be developed will be utilized entirely by the present zinc-reduction works or an addition thereto.

## BOOK REVIEW.

**Mining Manual and Mining Year Book, 1916, by W. R. Skinner, Published by Walter Skinner, London, E.C. Price $4.25. For sale by book department Canadian Mining Journal.**

This is the 30th year of a record of information concerning mining companies. The compilers have endeavored to place before the public a standard reference book on mines, and they have succeeded. The mines interesting to Londoners are scattered all over the world and the labor involved in such a compilation is correspondingly great

While primarily a record of mining companies the Mining Manual or "Skinner's Red Book" as it is not infrequently called, contains an abundance of general information on mines and mining. Naturally South Africa figures prominently in this work and those who have occasion to hunt up data on the Rand mines will find the Manual a handy reference volume.

# SPECIAL CORRESPONDENCE

## COBALT SOUTH LORRAIN AND GOWGANDA

### McKinley-Darragh.

By far the most interesting developments in the underground workings of the camp to-day are at the McKinley-Darragh. It would be entirely premature to place too much importance on the successful development of another section of this property, until further drifting has been done; but it can be said now that developments are most promising for the opening up of an entirely new mine. The management has always believed, previous to about a year ago, that when the veins were worked through the conglomerate to the Keewatin, that further research into Keewatin or along the contact would be futile and a purposeless waste of money. Research work undertaken about a year ago, demonstrated latent possibilities and since that time exploration has been pushed along fault lines to the north and east. Quite recently in a cross-cut from the winze at 400 feet, before the conglomerate was struck, the cross-cut picked up a vein in the Keewatin—barren as is usually the case. Immediately the face of the drift entered the conglomerate the character of the vein changed and within a few rounds there was some silver showing. This development is the more promisiing, since the vein was discovered by a system of working out various faults in this part of the ground, at exactly the point where it was expected. There is therefore no reason to believe that the extensions of further orebodies worked in the upper levels of the conglomerate should not be discovered in this section of ground to the north and east of the present workings. Such a development would be important not only to the McKinley-Darragh, but would undoubtedly stimulate further exploration along the contact in other mines.

The Savage Mine of the McKinley-Darragh is still shipping but the supply of ore is running short and unless more discoveries are made, this auxiliary of the McKinley-Darragh Savage Mines will shortly be closed down.

### Hudson Bay

While slashing down the party wall of vein 64 between the Hudson Bay and the Nipissing, the Hudson Bay Mining Company has discovered a very rich lens of ore 50 feet from the Nipissing line. It parallels vein 64. It is from 6 to 8 inches wide, of very high grade. As far as can be ascertained it has no direct relation with vein 64. The extent of it has not yet been ascertained and it may just be a lens lost by the old management, or it may really be another vein, in which case, of course, it will be of the utmost importance to the Company. This find has nothing to do with the exploration work which is being carried out in the north-east corner of the property.

### Reeves Dobie

The Reeves Dobie at Gowganda has taken out 22,143 pounds of very high grade silver ore. This ore was obtained at a depth of 23 feet and not more than 20 feet away from the old mill. The work is being carried out by Mr. Christopherson and his Minneapolis associates, upon a small scale. The ore is being gouged out from the surface and little effort is being made to develop the property beyond such point as ore is actually seen to exist.

The great handicap to the Gowganda camp is the Gowganda road. This has been deteriorating in the last two years, until now it is merely a bush trail. The 27 miles can not be made in much less than 11 hours, so vile is the going and freighting teams are obliged to take very small loads

### Adanac

Another patch of high grade has been struck in the west winze of the Adanac. The winze is now down over ten feet from the point where the first leaf silver was encountered and it is still holding well. The Cartwrights have now sold out their entire interests to a Buffalo Syndicate.

### Ore Shipments

The ore shipments from the camp in June were as follows:—

| | High | Low | Tons |
|---|---|---|---|
| Aladdin | 26.77 | | 26.77 |
| O'Brien | 31.00 | | 31.00 |
| Penn Canadian | 85.76 | | 85.76 |
| Seneca-Superior | 79.11 | | 79.11 |
| LaRose | 43.65 | 85.60 | 129.25 |
| Min. Cor.—Townsite City | 169.07 | | 298.43 |
| Cobalt Lake | 129.36 | | |
| McKinley-Darragh | 195.54 | | 195.54 |
| Coniagas | 63.30 | | 63.30 |
| Dominion Red | | 329.50 | 329.50 |
| Beaver | 47.87 | | 47.87 |
| Timiskaming | 42.04 | | 42.04 |
| Kerr Lake | 30.28 | | 30.28 |
| Casey Cobalt | 63.30 | | 63.30 |
| Wattlaufer | 12.26 | | 12.26 |
| | 1019.31 | 415.10 | 1434.41 |

### Lorrain Consolidated

The Lorrain Consolidated in South Lorrain has been pumped out and a gang of men is now at work. Mr. Mark Harris has secured substantial backing for this silver prospect and there is no doubt that it will receive full value in development.

### Trethewey

The Trethewey Mining Company is now making regular shipments and will continue to do so as the ore lasts. The first shipment went out in June.

### Peoples

The Peoples Mining Company have now started drills in the shaft. It was found necessary before doing so, to build a bulk head on the 200 foot level, 25 feet from the shaft and a dam on the 100 foot level, so as to insure the workings being comparatively dry. The shaft is 310 feet deep and it will be continued to the contact, an estimated depth of another 250 feet. It is estimated that 80 feet can be made each month.

### Coniagas

The Coniagas Mining Company has declared a dividend for August the first. Owing to various reasons, not fully disclosed to shareholders, the Coniagas Mines passed the spring dividend, but will now resume payments on the old basis.

### Nipissing

The Nipissing production in the month of June showed increase of almost $3,000, but bullion shipped fell from $420,822 in May to $193,403. This was probably due to the fact that the Nipissing does not believe that the lower price of silver obtaining will be permanent. The development at vein 490 is still quite promising. Below the 4th level the south drift was in ore all the month and was advanced 54 feet. There are 3 veins in this drift and it was generally necessary to make the drift 8 to 12 feet wide. The largest vein assayed at times as high as 2300 the 3 veins averaged for the month 8 inches, assaying 1200 ounces. During the latter part of June the north face has shown two veins aggregating 6 inches in width and averaging 1200 ounces. The winze level is at a depth of 112 feet below the 4th level. The vein has now been drifted on for a total distance of 390 feet, of which amount 300 feet will average 1000 ounces over 6 inches. About 75 tons a day

are going to the low grade mill from the surface dumps near shafts 12 and 86. The fire which destroyed the refinery building, only occasioned a loss of three days time. There was no loss to contents.

## PORCUPINE KIRKLAND LAKE AND BOSTON CREEK.

### New Fields.

The rushes to various alleged new gold fields have simmered down. The second sampling of veins said to carry good value on the Hurricanaw River has been disappointing and many prospectors returned without even staking. On the Transcontinental west, two or three companies are working with small gangs of men. One or two companies are working near Tashota and one is developing the King Dodds property. There are not many prospectors in this section of the country. Kamiskotia too, has been more or less abandoned since the Chisholm corporation threw up the option on the Jamieson claims. As long as good prospects can be found and worked near the railway, there will not be much competition for prospects far back in the bush and away from railway communication.

### Hollinger

The first report of the Hollinger Consolidated has been received. It is noted that in order to comply with the proposals for the merger, the Hollinger surplus of over $1,600,000 has been converted into a deficit of over $178,000. This is very largely due to the fact that the merger dates from January the 1st, 1916 and thus calls for the disbursement of $720,000 in dividends, to shareholders Mines. This is the amount that shareholders of the Hollinger Gold Mines were paid before the merge was carried into effect. It is noted in the report that the new mill is not making such speedy progress as could be desired, owing to the slow delivery of material. Until additions are completed, the maximum capacity of the plant has been fixed by the management at 1900 tons a day. The maximum has not yet been reached, through various causes, but it should soon be so. The average mining costs per ton from January the 1st to June the 16th, amounted to $2.03 per ton. Of this amount no less than $0.56 per ton is credited to development or the getting of stopes ready for the time when the new mill would make increased demands on the tonnage of the combined properties. The milling costs were $0.89 per ton and total costs, including taxes, etc., were $3.61 per ton. The average value of the ore treated was $8.80 per ton. This compares with $8.00 in May and $9.09 in April. Total costs were slightly less in May and mining costs very much less than the average for the period. During the whole of the first period of the year, prior to the merger becoming afact at the mine, there was no ore stoped below the 550 ft. level and only 11,349 tons on that level.It is therfore apparent that while there has been a large amount of ore developed below this level on the Hollinger, there has been no necessity to stope any of it to date.

### Schumacher

It has been decided to sink a new shaft at the Schumacher Gold Mines. This shaft will be put down between the present shaft and the shore of Pearl Lake. The first level will be at a depth of 200 feet. During the month of June the Schumacher mill treated ore of a gross value of $24,500. This compares with $21,000 in May. Mining and milling costs for the past 4 months have averaged $3.80 per ton. The mill averaged around 340 tons perd ay.

### Dome Lake

At the Dome Lake a new drum for the cyandide treat ment of the concentrate tails has been ordered. This drum is reported to be a success metallurgically, but mechanically there were so many defects that it was found impossible to keep it running more than 50% of the time. The new orebody at the 400 foot level is holding out well.

### Vipond

The report of the Vipond for the period ending June 30th was disappointing. The tonnage milled was 10,185 and bullion produced $37,600. Total operating costs amounted to $4.45 per ton, so that there was a net loss on every ton milled. It should be pointed out however, that the last day of this quarter was probably the last day on which the lower grade ore at the upper levels of the Vipond had to be relied upon to make profit. The preparation for stoping on the 400 ft. level was practically completed on June the 30th and a far better grade of ore is now being treated in the mill, from the 400 ft. level. It is understood that while the negotiations for the merger of the North Thompson and the Vipond have not yet been consummated the deal is still in the air and may be completed at any time.

### East Dome.

Mr. W. J. Trethewey, manager of the West Dome Consolidated, has purchased the Excelsior Mining Company's properties in Shaw Township. Before the break-up, the Excelsior Mining Company had taken in the small two-stamp mill from the Gold Reef and operated it. They were compelled to desist at the time of the break-up, owing to the lack of supplies and work had not been resumed since. It is known that there is a narrow vein of quite rich ore and a sulphide dyke which may be made to pay, if worked on a large enough scale.

### Lake Shore

Kirkland Lake development is receiving a great deal of attention. This is partly due to the larger plans of the Lake Shore mine. After opening up one of the richest shoots of gold ore which has been seen in the north country, the Lake Shore has closed down to install a much larger power plant and to work out details for a mill. The Lake Shore has on three levels developed a tonnage which certainly justify the erection of a mill. In the meantime the power plant will be installed and as soon as it is running further development will proceed.

### Teck-Hughes

Developments underground at the Teck Hughes are favorable as far as they have gone. Stopes have for some time been full of ore and nothing but development work is proceeding, until power can be obtained from the mill. The mill is now so near completion that it could be run within a very short time. As it will be at least October before any power can reach the camp, there is no hurry on the part of the management to put the mill in a position where it can be turned over at once.

### Hydro Electric Power

The transmission line from Cobalt through the farming district, Boston Creek and Kirkland Lake has actually been commenced. Quite a little difficulty was experienced in obtaining the right of way through the farming townships, after it had been found impossible to make arrangements with the T. & N. O. to share their right of way. The bargaining with various townships took no little time and held up actual construction. Now actual construction has commenced. Many of the poles are on the ground The copper wire has all been purchased and gangs have been set to work at various points to clear bush where necessary. The line will be 65 miles in all and the substation will be near the Tough-Oakes. There is no doubt that completion of the line will almost cut the fuel bills of the existing operating companies in two. While the Tough-Oakes is supplied with some electric power, its demands have so outrun the supply that it will still be

the largest customer of the Northern Ontario Light & Power Co., in the Kirkland Lake district. The Company has given no guarantee of when the line will reach Kirkland but as estimated, the power should be available in October or November.

### Boston Creek

At Boston Creek the Miller Independence has found another vein 500 feet north of the first discovery, which promises to be of great importance. Only a very little surface work has been done on it yet, but it shows free gold and some telluride ore in fair quantities.

At the R. A. P. Syndicate in Boston Creek all underground work is now proceeding under contract. In the 200 foot level another shoot of rich ore has been encountered.

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## MINERAL INVESTIGATIONS IN BRITISH COLUMBIA.

The importance of the mining industry and the possibilities of its development were emphasized by Hon. Lorne A. Campbell, Minister of Mines for British Columbia, in a speech on the second reading of the Government bill to devote $200,000 toward the construction of roads, trails, and bridges to mining properties.

"The object of this Act is to aid in the development of mines," said Mr. Campbell. "It is a well known fact that in the early days of the province mining was the chief industry and was brought about by the early prospectors from the south of the line, who came to British Columbia and opened up the country by means of trails and roads at their own expense or by parties who were interested in prospecting. We find that when the country reached a certain stage of development these prospectors were assisted by the Government up to a certain percentage of the cost of said trails. Later, when ore was found in payable quantities, many of these trails were widened and turned into wagon roads and later were followed by railways. This applies more particularly to the interior of the province. The development brought about by the early prospector was the means of establishing an industry that has increased from year to year until today we find that the start of many other industries which have been established can be attributed to mining.

"At present all roads, trails, and bridges are under the Department of Public Works, and it is not contemplated in this bill that the Mines Department should in any way encroach upon the province of the Works Department, but that the latter shall be provided with extra funds to enable it to supply the special aid, as outlined, to mineral districts which in the opinion of the Minister of Mines are in need of such aid. The experience of the Public Works Department has shown that many claims have been made on the different district votes, more particularly for the construction of trunk roads and providing means of transportation for the settlers.

"In many instances the trails and roads to mineral districts receive only a very small proportion of the district grant, and it is the intention of the Mines Department to arrange that whatever portion of the general grant is available for roadwork in mineral districts, the work of constructing trails or roads will be carried on as in the past and that in the event of a shortage of funds a certain percentage of the money available under the provisions of this bill may be used to carry to completion the work of constructing such trails and roads; but no expenditure will be made until such time as the Minister of Mines is satisfied that the expenditure is warranted.

The latter part of section 3 gives power to grant partial aid to parties who have found it necessary to construct their own roads, but no such aid will be given until such time as this work is completed and is inspected by an engineer, and if the work is up to the standard as established by the Government, and is approved, a refund, not to exceed 50 per cent. of the total cost, will be made on account of the expense of such work; and any such road built by private parties is as much open to the public as to the builders, because experience has shown that when roads so constructed become public property and open to the use of the public, other property is opened and operated.

"The reference I have made to Bill 77 leads me to make further reference to Vote No. 25, contained in the estimates this session, in which the sum of $24,000 is provided for the Department of Mines for the expenses of temporary parties in the field, including salaries and travelling expenses. The amount voted for this purpose in 1915 was $6,000; the increase this year had in contemplation an extra amount of field work to provide the data which will be required by the Minister of Mines in considering applications under Bill No. 77. I believe that many applications will be made for special aid under this bill, and in order that the department may be in a position to determine which applications are worthy of consideration, it is our intention to have at least one qualified mining engineer occupied in making examinations.

"Of late considerable interest has been taken in the iron deposits of the Coast district with a view to establishing an iron and steel industry. In this connection we have undertaken a special investigation for a report on the subject. I have already started one engineer in the investigation of the iron ore properties on Vancouver Island, and I intend, as soon as arrangements can be made, to have iron properties tributary to the Coast investigated, and possibly others in the interior as well.

"I have arranged for a party under a competent engineer to make a thorough investigation of the district in the neighborhood of Alice Arm, of Observatory Inlet, and north of Stewart, at the head of Portland Canal; this on account of the attention that is being attracted by the success attained by the Granby Company at Anyox, and by prospects which are showing signs that further development work will lead to the opening of other shipping properties. It is planned also to put several parties in the field to examine mineral locations along the mainland coast and islands adjacent.

"It is my intention, further, to have a party start at Hazelton, on Skeena river, and travel through a section of the country lying in a south-easterly direction, continuing to the line of the Pacific Great Eastern Railway. This district gives signs of much promise in indications of mineralization.

Still another party is contemplated to examine mineral discoveries northward from Vancouver and along the general route of the Pacific Great Eastern Railway. Other parties will do field work in the interior of the province."

## DIVIDENDS PAID BY BRITISH COLUMBIA MINING COMPANIES.

Published figures make it appear that the total of dividends of mining companies operating in British Columbia for the current year to June 30 will be $1,666,850. The amounts set against the several companies on the dividend-paying list are as under:

| Company. | Total for Half-year. |
|---|---|
| Con. Mining and Smelting | $ 420,517 |
| Crow's Nest Pass Coal | 186,378 |
| Granby Consolidated | 449,955 |
| Hedley Gold | 120,000 |
| Sheep Creek Motherlode | 137,500 |
| Rambler-Cariboo | 52,500 |
| Standard Silver-Lead | 300,000 |
| Total for six months | $1,666,850 |

The amount for the Consolidated Mining and Smelting Company of Canada, Ltd., is much higher than for the corresponding period of last year, but new stock has since been issued, so there is more outstanding now.

The total for the whole of the year 1915 was $1,586,820, and for 1914 $1,689,331. It would appear, therefore, that there is good reason to expect the total for 1916 to be as much as the combined total for the two immediately preceding years. Further, there is, certainly in the case of the Granby Consolidated Co. and probably in other instances, a much larger amount of undivided profits this year than for the corresponding periods of the two previous years with which compari-

## STANDARD SILVER-LEAD MINING CO., B.C.

Delay in smeltery settlements prevented completion of the financial statement of the Standard Silver-Lead Mining Co. for April until June 9. The company operates mines and a concentrating mill near Silverton, Slocan, B.C. The statement shows that the net profit for the month was $86,773, which, added to the balance on March 31 of $284,163, made a total of $370,936, less dividend of $50,000 paid on April 10, or $320,936 net. Of this amount $201,263 was cash in bank and $167,921 value of ore shipped but not then settled for, less due on vouchers and payable, $48,427.

The total receipts for April were $131,309, as follows: Preliminary settlements for 729 tons of silver-lead products, $95,115, from zinc sales $26,847, umpire's awards $1,052, boarding house $4,097, store supplies $3,387. Disbursements were: For ore production $21,586, tramming $953, milling $4,790, power $489, general expense $918, shipping and selling $1,639, boarding house $3,351, taxes $3,000, insurance, etc., $1,036, development $3,279, Aylard tunnel $2,254, home office account $1,234, total $44,535.

The net profit for April was much less than for March, there having been much more ore settled for in connection with the latter month and a net profit of $136,943 credited. March settlements were for 1,295 tons of silver-lead ore and concentrate, $172.347, and for zinc $5,432, as compared with April amounts shown above.

## BY-PRODUCT COKING OF COAL.

The great development of by-product coking of coal in Germany has assured her an uninterrupted and adequate supply of modern explosives. The value of this development may be measured by the importance of munitions in deciding the outcome of the war.

In the past the whole world has been dependent upon Germany for dye-stuffs and other substances prepared from the derivatives of coal tar. Thus both in peace and war Germany possessed a great industrial advantage over other nations.

British plants are now being established to cope with the demand for picric acid and trinitro-toluene, while the United States is also profiting by the lesson learned from the war. Before the war there was but one company in the United States producing distillation products on a large scale, while the latest statistics show that over 8,000,000 tons of coal were carbonized in by-product ovens last year, yielding over 4,800,000 gallons of benzol and 1,300,000 gallons of toluol. The full annual capacity of the benzol recovery plants now in operation and in course of construction is estimated to exceed 20,000,000 gallons.

Although Canada has the third largest reserves of coal in the world, beehive coke ovens, wasting the by-products, are still used in some sections and not a single additional by-product oven has been installed since the war. The war should teach Canada the ovious lesson that, whether for war or peace, it is criminal folly to neglect the utmost utilization of those resources which are lying latent in her bounteous supplies of bituminous coal.—W. J. D.

## MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1915.

The following are the revised official figures of the mineral production of British Columbia in 1915, and, for comparative purposes, those for 1914 as well:

| | 1914 | | 1915 | |
|---|---|---|---|---|
| | Quantity. | Value. | Quantity. | Value. |
| Gold— | | | | |
| Placer, oz.. | 28,250 | $565,000 | 38,500 | $770,000 |
| Lode, oz. .. | 247,170 | 5,109,004 | 250,021 | 5,167,934 |
| Total gold | | $5,674,004 | | $5,937,934 |
| Silver, oz. ... | 3,602,180 | 1,876,736 | 3,366,506 | 1,588,991 |
| Lead, lb. ... | 50,625,048 | 1,771,877 | 46,503,590 | 1,939,200 |
| Copper, lb. .. | 45,009,698 | 6,121,319 | 56,918,495 | 9,835,500 |
| Zinc, lb. .... | 7,866,467 | 346,125 | 12,982,440 | 1,460,524 |
| Total value of metalliferous | | $15,790,061 | | $20,762,149 |
| Coal— | | | | |
| Tons 2240 lb | 1,810,967 | 6,338,385 | 1,611,129 | 5,638,952 |
| Coke— | | | | |
| Tons 2240 lb. | 234,577 | 1,407,462 | 245,871 | 1,475,226 |
| Miscellaneous products | | 2,852,917 | | 1,571,181 |
| Total value of production | | $26,388,825 | | $29,447,508 |

The increase for 1915 over 1914 of $3,058,683 is nearly 12 per cent.. The gross value of the metallic minerals recovered in 1915, $20,762,149, represents an increase of $4,972,088, or about 31.5 per cent., as compared with that of 1914. The highest previous total value was that for 1906, for which year the value of the metallic minerals was $18,432,502, but the average prices of silver, lead, and copper were higher. For last year they were: Silver 49.7c., lead 4.673c., and copper 17.275c.; for 1906 silver was 68c., lead 57c., and copper 19.3c., which gave the earlier year an advantage in regard to those metals of more than $1,000,000. The production of copper last year was larger by 5,462,000 lb. and of zinc by 4,482,000 lb. than in any other year in the history of mining in the province.

# MARKETS

## NEW YORK MARKETS.

July 25, 1916—Connellsville Coke—
Furnace, spot, $2.65 to $2.75.
Contract, $2.35 to $2.50.
Foundry, prompt, $3.25 to $3.50.
Contract, $3.25 to $3.50.
July 25, 1916—Straits, Tin, 38.00 cents.
Copper—
Prime Lake, nominal, 25.00 to 25.50 cents.
Electrolytic, nominal, 25.50 to 26.00 cents.
Casting, nominal, 23.50 to 24.00 cents.
Lead, Trust price, 6.50 cents.
Lead, outside, 6.25 cents.
Spelter, prompt western shipments, 10.42½ cents.
Antimony—
Chinese and Japanese, nominal, 13.50 cents.
American, nominal, 13.50 cents.
Aluminum—nominal—
No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.
Pure 98-99 per cent. remelt, 57.00 to 59.00 cents.
No. 12 alloy remelt, 47.00 to 49.00 cents.
Powdered aluminum, $1.00 to $1.15.
Metallic magnesium—99 per cent. plus, $3.50 to $3.75.
Nickel, 45.00 to 50.00 cents.
Cadmium, nominal, $1.25 to $1.50.
Quicksilver, nominal, $80.00.
Platinum, nominal, $60.00.
Cobalt (metallic), $1.25.
Silver (official), 67⅞ cents.
Metal Products.—Following base prices are all f.o.b. mill, but prices are purely nominal.
Sheet copper, hot rolled, 37.50 cents.
Sheet copper, cold rolled, 38.50 cents.
Copper wire, nominal, 31.00 cents.
Copper wire, nominal, October, 28.75 cents.
High sheet brass, 38.00 to 39.00 cents.
Seamless brass tubing, 44.00 to 45.00 cents.
Seamless copper tubing, 44.50 to 45.50 cents.
Brazed brass tubing, 45.50 to 46.50 cents.
Brass wire, 38.00 to 39.00 cents.
Brass rods, 38.00 to 39.00 cents.
Sheet zinc, f.o.b. smelter, 15.00 cents.

## TORONTO MARKETS.

July 27—(Quotations from Canada Metal Co., Toronto)—
Spelter, 14 cents per lb.
Lead, 8¼ cents per lb.
Tin, 45 cents per lb.
Antimony, 20 cents per lb.
Copper, casting, 27 cents per lb.
Electrolytic, 28 cents per lb.
Ingot brass, yellow, 15 cents; red, 18 cents per lb.
July 27—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $8 per ton.
Coal, bituminous, $5.50 per ton.

## SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| July 7 | 60¾ | 29 1/16 |
| " 8 | 62 | 29⅝ |
| " 10 | 60 | 28⅝ |
| " 11 | 61 | 29⅛ |
| " 12 | 67⅞ | 29½ |
| " 13 | 62⅞ | 30 |
| " 14 | 62⅝ | 29⅞ |
| " 15 | 61⅞ | .... |
| " 17 | 62⅞ | 29 1/16 |
| " 18 | 62⅜ | 29¾ |
| " 19 | 62⅛ | 29⅝ |
| " 20 | 62¾ | 29⅞ |
| " 25 | 62⅞ | 29 1/16 |

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto.)
As of close July 25, 1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Atlantic Steel | 55.00 | 62.50 |
| Canada Cement | 64.00 | 65.00 |
| Consolidated Arizona | 1.37 | 1.50 |
| Emma Copper | .43 | .47 |
| Howe Sound | 4.62 | 4.75 |
| International Petroleum | 10.25 | 10.50 |
| International Nickel (new) | 44.50 | 45.00 |
| Kennecott Copper | 46.12 | 46.50 |
| Maxim Munitions | 4.75 | 4.87 |
| Midvale Steel | 62.87 | 63.12 |
| Magma | 14.50 | 15.00 |
| Mother Lode | .32 | .33 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex | .07¼ | .07½ |
| Dome Extension | .34½ | .35 |
| Dome Lake | .32½ | .33 |
| Dome Mines | .25¾ | .26 |
| Foley O'Brien | .50 | ... |
| Hollinger | 29.25 | 29.50 |
| Jupiter | .28 | .30 |
| McIntyre | 1.44 | 1.50 |
| McIntyre Extension | .40 | .45 |
| Moneta | .12¾ | .13¼ |
| Plenaurum | ... | .70 |
| Porcupine Crown | .71 | .74 |
| Porcupine Imperial | .03⅝ | .04 |
| Preston East Dome | .04½ | .04¾ |
| New Ray | .40 | .41 |
| Teck Hughes | .25 | .26 |
| West Dome | .35 | .36 |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac | 1.82 | 1.88 |
| Bailey | .07⅛ | .07½ |
| Beaver | .37 | .38 |
| Buffalo | ... | 1.12½ |
| Chambers Ferland | .20 | .20½ |
| Coniagas | 4.00 | 4.40 |
| Crown Reserve | ... | .45½ |
| Foster | ... | .07 |
| Gifford | .05 | .05¼ |
| Gould | .00¼ | .00½ |
| Great Northern | .04 | .05 |
| Hargreaves | .03¾ | .04 |
| Hudson Bay | 57.00 | ... |
| Kerr Lake | 4.40 | 4.55 |
| La Rose | .60 | .65 |
| McKinley | .53 | ... |
| Nipissing | 6.80 | 6.95 |
| Ophir | .06¾ | .07 |
| Peterson Lake | .22¾ | .23 |
| Right of Way | .04 | .05¼ |
| Seneca Superior | .45 | ... |
| Temiskaming | .53½ | .54 |
| Trethewey | .21 | .22 |
| York Ontario | .01¼ | .02 |
| Wettlaufer | .11 | .12½ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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**Wire (Bare and Insulated)—**
Standard Underground Cable Co., of Canada, Ltd.

## ALPHABETICAL INDEX TO ADVERTISERS


A

Allan, Whyte & Co. ..... 2
American Zinc Lead & Smelting Co. ..... 10

B

Bath, Henry & Son ..... 13
Balback Smelting & Refining Co. 13
Beatty, Blackstock, Fasken, Cowan & Chadwick ..... 12
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd..... 4

C

Campbell & Deyell, Ltd. ..... 11
Canadian Copper Co..... 6
Canadian Explosives, Ltd. ..... 5
Can. Ingersoll-Rand Co., Ltd..... 1
Canadian Inspection & Testing Laboratories, Ltd. ..... 11
Canadian Laboratories, Ltd. ..... 11
Canada Metal Co. ..... 12
Cohen, S. W. ..... 11
Consolidated Mining & Smelting Co. ..... 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. ..... 13
Curtis's & Harvey .....
.....Outside Back Cover

D

Darling Bros., Limited ..... 9
Dept. of Mines, Canada.....
.....Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd..... 9
Dominion Engineering & Inspection Co. ..... 11
Dorr Co. ..... 11
Dwight & Lloyd Sintering Co., Inc. 7

E.

Escher Wyss & Co. ..... 4

F

Ferrier, W. F. ..... 11
Fleck, Alex. ..... 9
Forbes, D. L. H. ..... 11
Fuller, A. S. & Co. ..... 12

H

Hassan, A. A. ..... 11
Hendrick Mfg. Co. ..... 6
Hersey, Milton Co., Ltd. ..... 11
Heys, Thomas & Son ..... 11
Hitchcock, C. H. ..... 11

I

Imperial Bank of Canada ..... 6
Industrial & Technical Press, Ltd.
.....Outside Back Cover
International Nickel Co. ..... 6

J

Johnson, Matthey & Co. ..... 11
Jeffrey Mfg. Co. ..... 10

L

Ledoux & Co. ..... 11
Lymans, Ltd. ..... 6

M

Mines and Copper Handbook..... 16
Murphy, Chas. J. ..... 11
Mussens, Ltd..... 10

N

Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

O

Orillia Molybdenum Co. ..... 16
Ontario, Province of .....
.....Inside Back Cover

P

Pacific Coast Pipe Co., Ltd. .... 9

Q

Quebec, Province of ..... 8

S

School of Mining ..... 16
Segsworth, R. F. ..... 12
Smart-Turner Machine Co., Ltd.. 9
Smith & Durkee Diamond Drill Co. ..... 12
Smith & Travers Diamond Drill Co. ..... 12
Smith, Sydney ..... 11
Spearman, Chas. ..... 11
Standard Underground Cable Co. of Canada, Ltd. ..... 9
Sullivan Machinery Co. ..... 2
Summerhayes, Maurice W. ..... 11

T

Tyrrell, J. B. ..... 11

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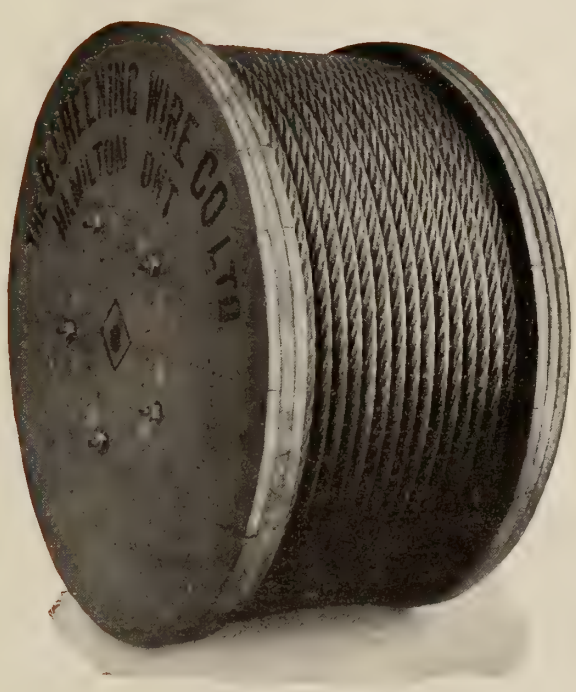
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Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1913, by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

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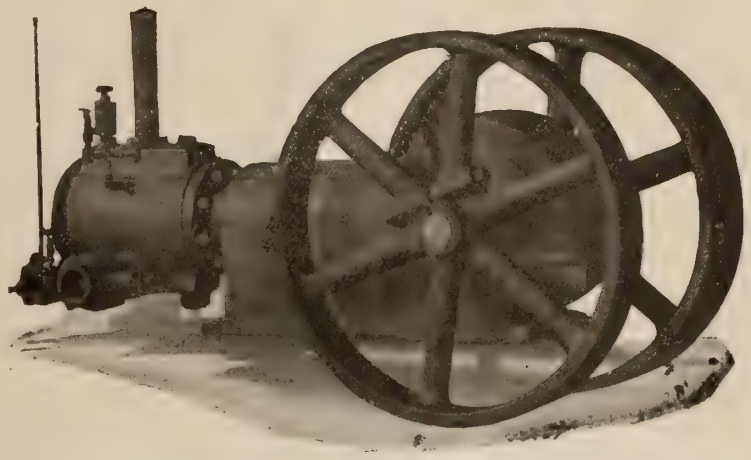
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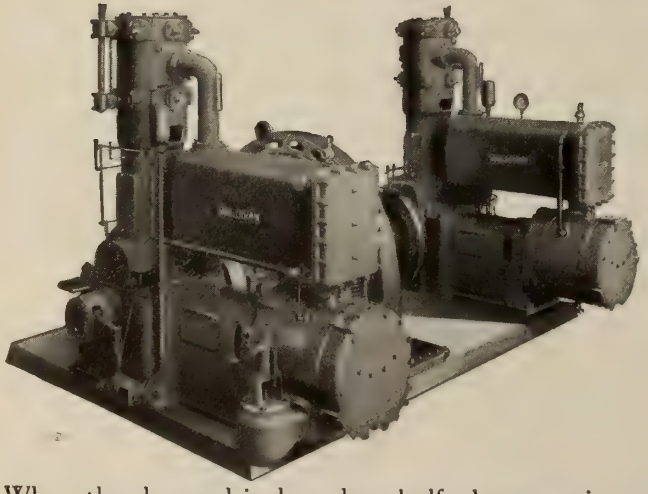
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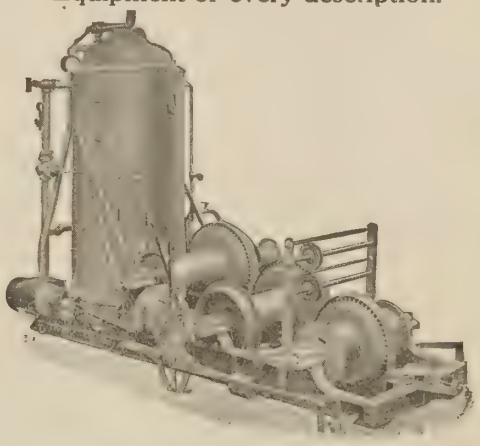
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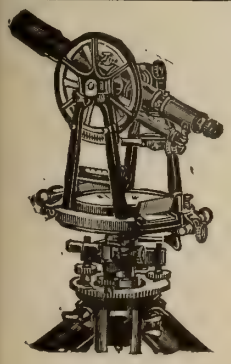
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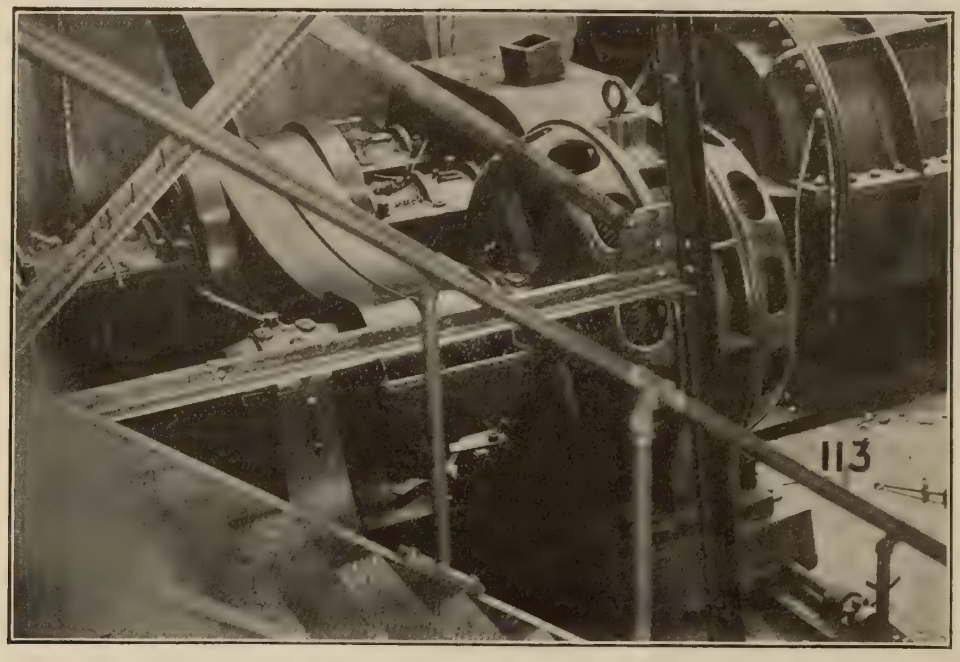
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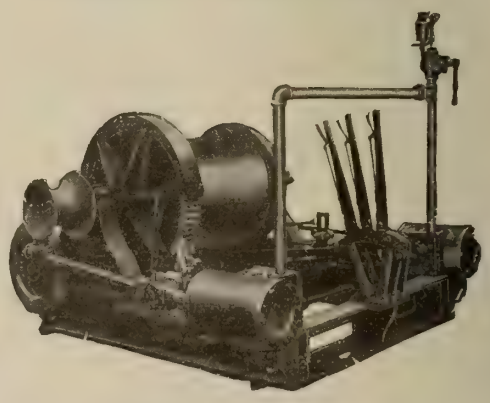
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CONTENTS

| Editorials— | Page. |
|---|---|
| Ontario's Nickel-Copper Industry | 383 |
| Nickel Contracts | 384 |
| U. S. Consumption of Nickel | 385 |
| Half-way Measures | 384 |
| Mr. Wilkie on the Nickel Industry | 385 |
| Composition of Natural Gas | 385 |
| The Discovery of Nickel | 386 |
| Separation of Nickel and Copper Sulphides | 387 |
| Chief Minerals of the Nickel-Copper Ores, by A. P. Coleman | 388 |
| Origin of the Sudbury Nickel-Copper Ores | 390 |
| Recent Developments in the Sudbury District | 391 |
| Nickel Steel | 393 |
| The Boston Creek Gold Area. By A. G. Burrows and P. E. Hopkins | 399 |
| Personal and General | 402 |
| Special Correspondence | 403 |
| Markets | 406 |

## ONTARIO'S NICKEL-COPPER INDUSTRY

Ontario has three wonderful mining camps—Cobalt, Porcupine and Sudbury. Cobalt, since its discovery in 1903, has produced nearly a quarter of a billion ounces of silver worth about $125,000,000. Porcupine gold deposits, discovered since Cobalt became famous, have yielded about $25,000,000 and the gold mines have just got nicely started on a long and prosperous career. The Sudbury district, a big mining camp before Cobalt was discovered, has produced matte containing about 250,000 tons of nickel and 150,000 tons copper. The value of the nickel-copper matte, assuming a value of 25 cents per pound for the nickel and 10 cents per pound for copper, is about $155,000,000.

The nickel-copper mines are now producing ore at an unprecedented rate and the output for 1916 is expected to contain about 40,000 tons nickel and 22,000 tons copper. The nickel-copper deposits have been proven to be of enormous extent and production could doubtless be maintained at the present rate for many years.

While Cobalt and Porcupine mines are well known to the public, the Sudbury mines appear to be well known to comparatively few Canadians. To some extent this is due to the fact that while a large number of companies are operating at Cobalt and Porcupine only two are producing and smelting ore in the Sudbury district. Cobalt and Porcupine mining stocks are much traded in and news from the silver and gold camps is of special interest to a large number outside of those directly connected with the industry. Of the companies operating at Sudbury one, the Mond, is an English company, in which few Canadians are financially interested. The other company, Canadian Copper, is a subsidiary of the International Nickel Co. This company has a very large number of shareholders, most of whom are Americans.

The Sudbury nickel-copper mines are the backbone of Ontario's mining industry. The Canadian Copper and Mond companies operating in the Sudbury district employ as many men as all the Cobalt and Porcupine companies together do. The nickel companies are employing in Ontario about 5,500 men and the wages paid this year will probably total $5,000,000. The companies spend millions for plant and supplies. Thousands of people in the Sudbury district are directly supported by the nickel industry and thousands of others in Sudbury and other parts of Ontario are benefitted by the market made by the operation of the mines and smelters.

The interest of Canadians in the nickel industry has been greatly increased by the war and the problem of controlling the export of nickel so that none may reach the enemy. The war has directed attention to the disadvantages arising from the fact that the nickel-copper matte from the furnaces of the Sudbury district is not refined in Canada.

The Mond company ships matte from its smelter at Coniston to Wales. The Canadian Copper Co. ships matte from its smelter at Copper Cliff to New Jersey. Neither company refines nickel in Canada.

The Mond is a British company and the product of its refinery is, of course, absolutely in British hands. The International Nickel Co. is, however, not under British control and it has been therefore necessary for our Government to make special arrangements to prevent Canadian nickel from reaching the enemy. The nickel company has, under this arrangement, been doing work of great importance to the Allied cause. Canadians have, however, learned their lesson, and are endeavoring to provide against any possible recurrence of present conditions.

The desirability of refining metals in our own country has been impressed on Canadians during the war, and the demand for control of export of nickel has been especially strong. Interest in the nickel question has created a demand for information concerning the Sudbury nickel-copper industry. We have therefore devoted a considerable portion of this number of the "Journal" to the nickel industry.

## NICKEL CONTRACTS

According to the Toronto World the British Government has cancelled its big contract with the International company, and is only bound to them now for the present year. The World says:—"The British Government has guaranteed the bonds of the British-American Nickel Co. to the extent of $2,000,000 and has made a contract with them to use up to half a million tons of nickel within ten years, and at the present price this, we take it, would amount to $5,000,000 a year. All this money that goes to the miners and refining process will be spent in Canada, and apparently profits will come to Canadians that happen to own shares in this company, whereas now most of the profits of and most of the work in International Nickel go to shareholders and workmen of that company in the United States, where most of the shares are held for Germany. If the British Government are so satisfied with the arrangement with the International Nickel Co., why this change? It will take our contemporaries some time to explain this and they will have further things to explain later on."

If the "World" had any idea of the extent of the known ore reserves of the British-American Nickel Co. and of the company's ability to produce nickel it would not so readily believe that the British Government has contracted with the British-American company for 500,000 tons of nickel. Having swallowed the statement the "World" goes on to make comments which are equally foolish.

At present the nickel companies operating in Ontario are producing at the rate of about 40,000 tons nickel per year. The "World" professes to believe that the British-American company has made a contract for half a million tons to be used by the British Government within ten years.

Half a million tons of nickel is just about twice the total production to date of Ontario's nickel mines. And yet the "World" would have its readers believe that the British Government has contracted for that amount with a company which is not yet producing.

## HALF-WAY MEASURES

Commenting on our objection to the suggestion that the present refinery of the International Nickel company be scrapped, the "Toronto World" says:—

"The 'Canadian Mining Journal' starts out with the statement that International Nickel has a big, expensive plant at Constable Hook, New Jersey, which it should be permitted to utilize for a term of years in refining nickel at least in sufficient quantities to supply the demands of the United States market. So long as it adheres to that position it can never advocate anything but half-way measures in dealing with nickel export and the nickel question generally. We appreciate what the 'Journal' has to say of the 'World' and we are glad to have it journey with us a little way. We would like to see it come out for a resolute national policy. It would be cheaper to buy that refinery at Constable Hook and scrap it than to have it stand in the way of our immediately adopting a truly national policy in regard to nickel."

Is the national policy in regard to nickel thus advocated worthy of support? Are we to begin by spending millions to compensate owners of plants which we do not intend to use and which may be as good as we could build here? Is such waste warranted? We think not.

We agree with the "World" in believing that changes in our methods of dealing with mine products are to be desired. We are ever ready to support reasonable suggestions which may lead to the utilization of our mineral resources in such a way that finished articles rather than raw materials may be exported. Suggestions which involve the needless expenditure of large sums of money and the disruption of industry are, however, deemed scarcely worthy of consideration. Waste of public funds or private investments should be avoided. We believe that a change should be made so that Canada may absolutely con-

trol the export of nickel, and we believe that this should and can be brought about without disregarding the rights of investors and the needs of manufacturers.

The "World" would kill off the New Jersey nickel refining industry before the Canadian is born.

## U. S. CONSUMPTION OF NICKEL

In its issue of August 8 the "Toronto World" says:—"The 'Canadian Mining Journal' declares itself against an embargo upon the export of nickel, and repeats, impliedly at least, what so many public men in this country have said expressly, namely, that all the Canadian nickel refined in New Jersey by International Nickel is either exported to allied countries or directly furnished to American manufacturers actually engaged in making munitions for the Allies."

The "World" is mistaken in interpreting anything which has appeared in these columns to mean that all or nearly all the nickel exported to the United States is re-exported to allied countries or used in the manufacture of munitions for the Allies. We have repeatedly stated that the United States is the largest consumer of nickel. The consumption for war purposes has been large, and for peace purposes also large quantities are used.

We have referred to the nickel used for war purposes in considering the proposal to prohibit export of matte. We have never, however, intimated that all the nickel in the matte exported to the United States is used for war purposes. It is surely no secret that nickel is being used in the United States in the manufacture of a countless variety of articles, some of which are to be found in almost every home.

If we remember rightly some member of Parliament has made the statement that all the nickel exported is used for war purposes or re-exported to allied countries. The statement is, of course, absurd, and we are not surprised that the "World" has objected to it. It rather surprises us, however, to find ourselves made to appear as believing such nonsense.

## MR. WILKIE ON THE NICKEL INDUSTRY

Writing in the "Canadian Magazine," Mr. George Wilkie says: "Nickel has been the subject of speaker and writer for years. The nickel ore is Canadian, but the nickel metal is entirely non-Canadian. The nickel ore is part of the very soil of Canada. It is torn from the Canadian rock and raised to the surface in Canada, for that is inevitable. But the moment it has been detached, the ore is out of the control of Canada and Canadians, and is sent out of her borders, having contributed to Canada the privilege and profit of operating the boarding-house at which the miners live while blasting and raising the ore. Some of the employed are Canadians residing permanently in Canada. Many are foreigners who are imported into Canada by the foreigners who control the industry. The nickel-mining community is no exception. It is hard to govern. It produces more than its share of disorder and crime. The population it gathers about it is vigorous for good or evil. That population we provide for—doubtless at a profit, and we govern and keep it in order—at an expense. A little tax on the value of the ore at the mine goes to the Province of Ontario. When you have cast up the account of those items the balance, if any, will show the profit and loss to Canada on this natural resource."

From Mr. Wilkie's article we assume that he has depended on "speaker and writer" for his information concerning the nickel industry. His knowledge of it does not seem to extend far beyond the contents of some few letters written by Government officials. His opening paragraphs make us wonder whether he visited the Sudbury district before venturing to write about it in what should be a first-class magazine. His knowledge of the nickel industry leads him to conclude his article with this: "So far as the advantage to Canada at large is concerned we are but little better off for the nickel that is in Canada than we would be if it were in Oklahoma."

Mr. Wilkie's article does not impress us as being a serious attempt to present the facts. It is to be regretted that the nickel mines are not controlled by Canadians and that the refining is not done here. That, however, does not warrant the publication of the writings of Mr. Wilkie.

## COMPOSITION OF NATURAL GAS

Mr. James Ashworth in the "Coal Age" (Vol. 10, No. 4) objects to our criticism of the report on "Petroleum and Natural Gas Resources of Canada," in so far as this referred to analyses of natural gas. We admit that all he says regarding gas found in coal mines may be true, but this has no necessary connection with the composition of natural gas unless Mr. Ashworth is prepared to prove that these two kinds of gas have the same origin.

Bulletin 42 of the United States Bureau of Mines not only gives analysis of natural gas from many districts, all of which show no hydrogen, carbon monoxide or heavy hydro-carbons, although previous analysis of gas from some of these localities by others have given hydrogen, etc., but it also explains the details of the methods of analysis and shows that the apparent presence of these constituents is due to a faulty mode of analysis. As this Bulletin is the most complete study of the composition and methods of analysis of natural gas up to the present, it is absurd for Mr. Ashworth to characterize it as "slight support." The most complete work of this nature published in Canada is in the Report for the Bureau of Mines (of Ontario) for 1914. This corroborates the results given in Bulletin 42 entirely, and shows the complete absence of the constituents referred to above in the large number of samples involved.

It is difficult to see by what process of reasoning Mr. Ashworth comes to the conclusion that we are of the opinion that "real natural gas is or should be pure methane." There is not a word in our criticism which would directly justify any such conclusion. The fact that Bulletin 42, to which we refer as an authority, gives a great number of analyses nearly all of which show methane should be indirect proof enough that we hold no such opinion.

In the last paragraph of Mr. Ashworth's article he states that "analysts of mine gases have failed to look for other hydro-carbon gases but have included them under the general term methane, which would appear to be the accepted conclusion of the writer of the editorial to which I have referred." There is absolutely not one word in the editorial Mr. Ashworth objects to about the composition of mine gases, any more than there was about the nature of artificial gas, although we are aware that both hydrogen and carbon monoxide are found in artificial gas in large quantities.



**Pouring furnace slag, Copper Cliff**

## THE DISCOVERY OF COPPER-NICKEL ORES IN SUDBURY DISTRICT.

According to Professor A. P. Coleman nickel was first reported from the Sudbury region by Wm. Murray, in 1856. The well known land surveyor, Salter, had found a disturbance of the compass on a meridian line north of Whitefish lake, and suggested that Murray should examine the place. He found "an immense mass of magnetic trap," specimens of which were sent to Sterry Hunt for analysis. Magnetic pyrites was found disseminated through the rock and the analysis showed the presence of some nickel and copper. Salter's line is now the boundary between Creighton and Snider townships, and the rock with pyrrhotite was obtained a little west of the famous Creighton mine, the greatest nickel mine in the world. However, the discovery attracted little attention, since at that time the metal nickel was a rarity of little practical importance and the region was a wilderness without roads, where canoes were the only practicable means of travel..

In 1883 the Canadian Pacific Railway reached the Sudbury region, and the stretch of flat plain in the interior of the nickel basin attracted the railway engineers, who brought the line by a steep grade up from Sudbury to what later became the Murray mine, from which the railway descends to Azilda between hills belonging to the acid edge of the eruptive. It is said that at this time Dr. Howie discovered on the summit of the pass a low hill of pyrrhotite with some chalcopyrite. Specimens shown to Dr. Selwyn, then Director of the Geological Survey, were pronounced valueless, since pyrrhotite from Canadian localities had not hitherto been found to contain more than a fraction of a per cent. of nickel.

Early in 1884 the railway reached this deposit and a cutting disclosed copper pyrites at what was afterwards known as the Murray mine. Other discoveries soon followed at what became the Lady Macdonald, Evans, Copper Cliff, Stobie and Blezard mines; all taken up for copper, the presence of nickel being at first overlooked. The Creighton mine was rediscovered not long after by another land surveyor, John McAree, who surveyed an adjoining township, though the mine was not opened up till several years later owing to its difficulty of access.

Prospectors swarmed over the region searching everywhere for the gossan which showed the presence of ore, and men like Thomas Frood, Henry Ranger, William McVittie, A. McCharles and others quickly learned that gossan and ore accompanied only one kind of rock, then called diorite, but now known to be norite. In a short time almost all the main deposits had been located, and two ranges, a southern or main range, and a northern, began to be distinguished.

The first important mining was done in 1886 at the Copper Cliff, where an open cut was made against the side of a steep gossan covered hill, the work being carried on by the newly formed Canadian Copper Co., which soon opened up also the Stobie and Evans mines. The first ore mined was supposed to be simply copper ore, as the name of the mine and company suggest; and until 3,000 tons were shipped to Constable Hook for treatment, the presence of nickel was not suspected. There, however, difficulties were met in smelting the ore, and assays showed that nickel was the disturbing element.

# SEPARATION OF NICKEL AND COPPER SULPHIDES

The chief sulphides of the nickel-copper ores of the Sudbury district are chalcopyrite (a sulphide of copper and iron), pentlandite (a sulphide of iron and nickel), and pyrrhotite (a sulphide of iron). The copper values are in the chalcopyrite. The nickel values are chiefly in the pentlandite. Some nickel occurs in the pyrrhotite, possibly in the form of small particles of pentlandite, or possibly actually replacing some of the iron in the pyrrhotite.

One of the main problems in treating the nickel-copper ores is the separation of the nickel and copper.





**Views of Converters, Copper Cliff, Ont.**
**Product is a matte containing 77 to 82 per cent. copper-nickel**

In the methods in use no attempt is made to separate the nickel and copper sulphides before smelting, and it has been generally assumed that separation is difficult. Recent investigations carried on at the University of Toronto, by Professor H. E. T. Haultain and Mr. F. C. Dyer, have shown, however, that the nickel and copper minerals can be easily separated by flotation. The flotation product is a high grade concentrate containing about 25 per cent. copper and a little nickel. The other sulphide product contains most of the nickel and only a trace of copper. A middlings product contains copper and nickel in about the proportions in which they occur in the ore.

The nickel concentrate is remarkably free from copper. The pentlandite and pyrrhotite sink together, giving a mixture of the sulphides of nickel and iron that might possibly be used for the direct formation of nickel steel. The copper concentrate is not so free from nickel as is the nickel from copper.

The method used in the University laboratories in treating the Sudbury ores will be described in a later issue. It is an original one and uses no oils nor acids nor modifying agents, but it is quite possible that similar results might be obtained by the Callow or Minerals Separation Co.'s processes.

## TONOPAH OFFICIALS AT THE PAS.

The Pas, Man., Aug. 4.—Philadelphia officials of the Tonopah Mining Co. are in The Pas to meet Mr. J. E. Spurr for a consultation. The latter will get in today from a trip from Flin-Flon through the Cranberry lakes to Herb lake. The officials arrived here yesterday, and they are J. H. Whitemen, C. B. Evans and Dr. J. A. Ellegood. Mrs. Whitemen and Mrs. Evans accompanied their husbands. The company's engineers, L. W. Garbrecht, H. C. Carlisle and George Bancroft, will be present at the meeting. The diamond drill continues at work on the Mandy claim at Schist lake, and considerable satisfaction is expressed with the results obtained to date. An indefinite drilling programme has been outlined for work throughout the fall and winter.—The Pas Herald.

## MINING DRILL STEEL.

Armstrong-Whitworth of Canada, Ltd., has recently installed a new electric furnace. This, with the crucible furnaces which have been in operation during the past year, enables the company to supply a complete line of carbon and alloy steels. Mining drill steel is now being made in Canada.

## CHIEF MINERALS OF THE SUDBURY NICKEL ORES.

By A. P. Coleman.

A considerable number of nickel-bearing minerals have been reported from the Sudbury region, the list including pyrrhotite, pyrite, marcasite, pentlandite, polydymite, gersdorffite, millerite and nickelite; but the number having any important relation to the ore deposits is very small, pyrrhotite and pentlandite being the only ones comonly found, and pyrrhotite the only one visibly present in all the ore deposits. There is some doubt, however, as to whether pyrrhotite is nickel-bearing in itself, since its nickel contents may be due to finely disseminated pentlandite. If this is correct the latter is the only niekeliferous mineral of importance in the region, though it cannot be seen in the ore at most of the mines.



**Mining copper-nickel ore in open pit, a method recently abandoned**

It will be observed that all of the minerals mentioned are compounds of iron or nickel or both metals with sulphur or arsenic. Secondary nickel minerals are almost unknown in the region, though the green silicate genthite is reported from the Wallace mine farther west. In this respect the Sudbury deposits resemble those of Norway and differ fundamentally from the next source of nickel in importance, New Caledonia, where sulphides or arsenides of nickel seem almost unknown.

### Pyrrhotite.

As the commonest of all the metallic minerals, pyrrhotite is naturally discussed first. Pyrrhotite or magnetic pyrites, forms much the largest part of the sulphides at every mine in the district, with the one exception of the Vermilion, a remarkably rich but small deposit, unique in many ways. The composition of pyrrhotite is somewhat variable, running, according to Dana, from $Fe_5 S_6$ to $Fe_{16} S_{17}$, the iron atoms never quite equaling in number those of the sulphur. It is difficult to separate the pyrrhotite from small amounts of other ingredients, such as pentlandite, chalcopyrite, and magnetite, which occur more or less in most specimens of the ore. After careful magnetic separation repeated several times, followed by treatment with dilute nitric acid to dissolve the pyrrhotite, leaving any magnetite behind, Dr. C. W. Dickson found that most analyses of the Sudbury pyrrhotite worked out to $Fe_8 S_9$, which may be looked on as the typical proportion of iron to sulphur in the region.

As pure pyrrhotite contains 60 per cent. of iron, it surpasses in percentage many workable ores of that metal and might naturally be looked on as a possible source of iron as well as nickel. The only attempt thus far made to use it so proved a failure, however. Ore from the Gertrude mine in its earlier days was unusually free from copper pyrites, and was smelted on a small scale for ferro-nickel by the Lake Superior Power Co., after it had been roasted sweet and the $SO_2$ used in the plant for sulphite pulp. However, it was found that copper pyrites increased so much in amount as the mine was developed that the process was given up. A small amount of copper is no longer looked upon as specially injurious in steel, and it may be that deposits will yet be found low enough in copper to be used in this way. The ore from one of the northern range properties is thought to be suitable for such uses. It certainly seems unfortunate that a metal destined to be combined with iron should first have all the iron with which it naturally occurs carefully slagged off from it by expensive processes.

If the chalcopyrite found with pyrrhotite were not so intimately mixed as it is in most cases, the two minerals might be separated magnetically.

As the Sudbury pyrrhotite always contains small amounts of rock or of rock-forming minerals, even when carefully selected, probably 40 or 45 per cent. of iron is all that could be hoped for from any of the mines worked on a large scale; but this is equal to many iron ores which are now mined and smelted in other parts of the world.

### Pentlandite.

By all means the most important mineral in the Sudbury deposits is pentlandite (Fe Ni) S, since in the great majority of cases this is considered to be the real nickel-bearing mineral; nevertheless it is rather rarely seen in the ores and has not been found in quite a number of mines. If carefully looked over, the Crean Hill and Creighton ores often show it, and the old Evans and Worthington mines furnished it also. The pentlandite of the Sudbury region is without crystal forms, but has a characteristic octahedral cleavage which distinguishes it from the enclosing pyrrhotite, which generally has no definite cleavage planes. On fresh surfaces the two minerals are almost the same in color, and the pentlandite is hard to recognize unless ones eye is well trained; but it soon weathers to a brassy yellow easily picked out from the bronzy background of pyrrhotite. Cleavage surfaces are sometimes an inch or more in diameter, though this is by no means common.

The proportions of iron to nickel in pentlandite are quite variable, the mineral as first described by Scheerer having only 18.35 per cent. of nickel, while some Sudbury examples contain nearly 40 per cent. of the metal.

Pentlandite was first recognized in Sudbury ores in 1891, by Prof. T. L. Walker, then chemist at Murray mine, who identified a specimen sent to him from Worthington by Dr. Barlow.

As pentlandite is practically non-magnetic and pyrrhotite is usually decidedly attracted by the magnet, it was natural to think that the two minerals could be separated magnetically, and elaborate attempts at such a separation were made by Browne, Barlow, Dickson and others; but it has been found that the minerals are too intimately mixed to permit of a complete separation except by methods too costly to be of practical value.

Some of the analyses show that 0.78 to 0.85 per cent. of cobalt occurs in the pentlandite, accounting probably for the cobalt contents of the standard matte of the region. The three closely related metals, iron, nickel and cobalt, replace one another more or less in their compounds.

### Chalcopyrite.

In addition to the sulphides containing nickel and iron there is one very important ore of copper almost invariably present, chalcopyrite or copper pyrites, Cu Fe $S_2$. Unlike most of the nickel minerals mentioned above chalcopyrite is practically constant in composition, containing when pure 34.5 per cent. of copper, 30.5 per cent. of iron, and 35 per cent. of sulphur. Chalcopyrite comes next in amount to pyrrhotite and pentlandite and is always a more conspicuous component of the ore than the latter mineral because of its striking greenish brassy hue and its liability to tarnish with irridescent colors. Good crystals of the minerals appear to be lacking. Copper pyrites may either be intimately mixed with the pyrrhotite or form considerable masses by itself. It appears to be more easily dissolved and redepositd than pyrrhotite and so is more frequently found in fissures in the country rock; and it is especially common near the walls of orebodies or associated with masses of rock enclosed in the sulphides, so that as a rule rocky ore contains a higher percentage of copper than ore rich in sulphides. In two important mines, the Copper Cliff and the Crean Hill, copper is present in larger amounts than nickel, and at Garson and Victoria mines it about equals the nickel; but all the other mines contain more nickel than copper. As the percentage of copper in chalcopyrite is about equal to the precentage of nickel in pentlandite, we may assume according to the usual theory, that pentlandite occurs in larger quantities than copper pyrites in most of the ores, though it is so rarely seen.

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## THE NICKEL-COPPER OUTPUT.

The following table shows the production of nickel-copper ore for each year since 1890, and the contents of the matte obtained on smelting the ore.

The matte produced up to the end of 1915 contained 237,202 tons nickel and 146,661 tons copper and a considerable amount of platinum, palladium, gold and silver. The value of the matte is estimated at $147,933,200. The refined products would be worth over $200,000,000.

The ore smelted during the past ten years has yielded about three per cent. nickel and over one and one-half per cent. copper. This is exceptionally high grade ore. Under present conditions it might be treated profitably for its copper content alone.

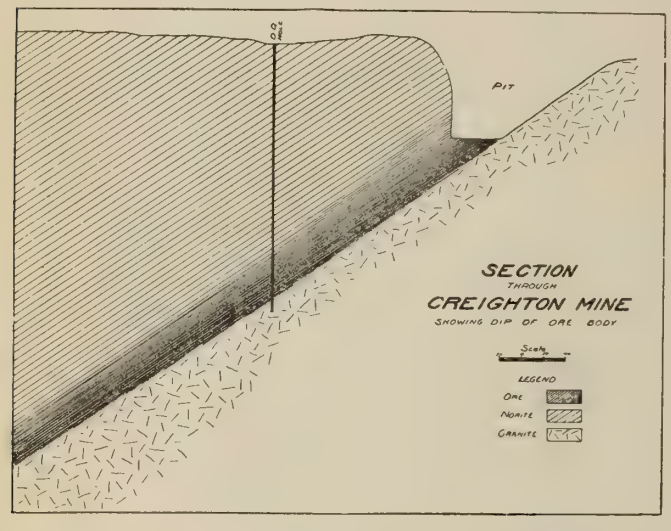
In addition to nickel and copper the Sudbury ores contain small quantities of the precious metals, gold, silver, platinum and palladium. The actual quantities are not reported. According to the International Nickel Company there was no production of these metals from Canadian ores at their works in 1913 and 1914.

**Production of Nickel and Copper in Ontario.**

| | Tons Ore Raised. | Tons Ore Smelted. | Tons Nickel in Matte. | Tons Copper in Matte. |
|---|---|---|---|---|
| Before 1890 | 100,000 | .... | .... | .... |
| 1890 | 130,278 | 59,329 | .... | .... |
| 1891 | 85,790 | 71,480 | .... | .... |
| 1892 | 72,340 | 61,924 | .... | .... |
| 1893 | 64,043 | 63,944 | 1,653 | 1,431 |
| 1894 | 112,037 | 87,916 | 2,570½ | 2,748 |
| 1895 | 75,439 | 86,546 | 2,315¾ | 2,365½ |
| 1896 | 109,097 | 73,505 | 1,948½ | 1,868 |
| 1897 | 93,155 | 96,094 | 1,999 | 2,750 |
| 1898 | 123,920 | 121,924 | 2,783¾ | 4,186¾ |
| 1899 | 203,118 | 171,230 | 2,872 | 2,834 |
| 1900 | 216,695 | 211,960 | 3,540 | 3,364 |
| 1901 | 326,945 | 270,380 | 4,441 | 4,197 |
| 1902 | 269,538 | 233,388 | 5,945 | 4,066 |
| 1903 | 152,940 | 220,937 | 6,998 | 4,005 |
| 1904 | 203,388 | 102,844 | 4,729 | 2,042 |
| 1905 | 284,090 | 257,745 | 9,503 | 4,524 |
| 1906 | 343,814 | 340,159 | 10,776 | 5,260 |
| 1907 | 351,916 | 359,076 | 10,602 | 7,003 |
| 1908 | 409,551 | 360,180 | 9,563 | 7,501 |
| 1909 | 451,892 | 462,336 | 13,141 | 7,873 |
| 1910 | 652,392 | 628,947 | 18,636 | 9,630 |
| 1911 | 612,511 | 610,788 | 17,049 | 8,966 |
| 1912 | 737,656 | 725,065 | 22,421 | 11,116 |
| 1913 | 784,697 | 823,403 | 24,838 | 12,938 |
| 1914 | 1,000,364 | 947,053 | 22,759 | 14,448 |
| 1915 | 1,325,973 | 1,272,313 | 34,039 | 19,608 |

# ORIGIN OF THE SUDBURY NICKEL-COPPER ORES

The generally accepted explanation of the origin of the Sudbury nickel-copper deposits is that they were formed by magmatic segregation. Put in other words, it is believed by many that the ores crystallized out of the molten magma from which the norite was formed. It is held that the sulphide settled to the bottom of a supposed molten sill of norite, and collected in hollows on the underlying rocks. The settling of the heavy sulphides, it is further considered by some, was due




---After A. P. Coleman

largely to gravity. This idea regarding the settling of sulphides by gravity was advanced many years ago in connection with the Meinkjar nickel mine in Norway.* The idea was later applied by A. P. Coleman to explain the formation of the Sudbury ores.

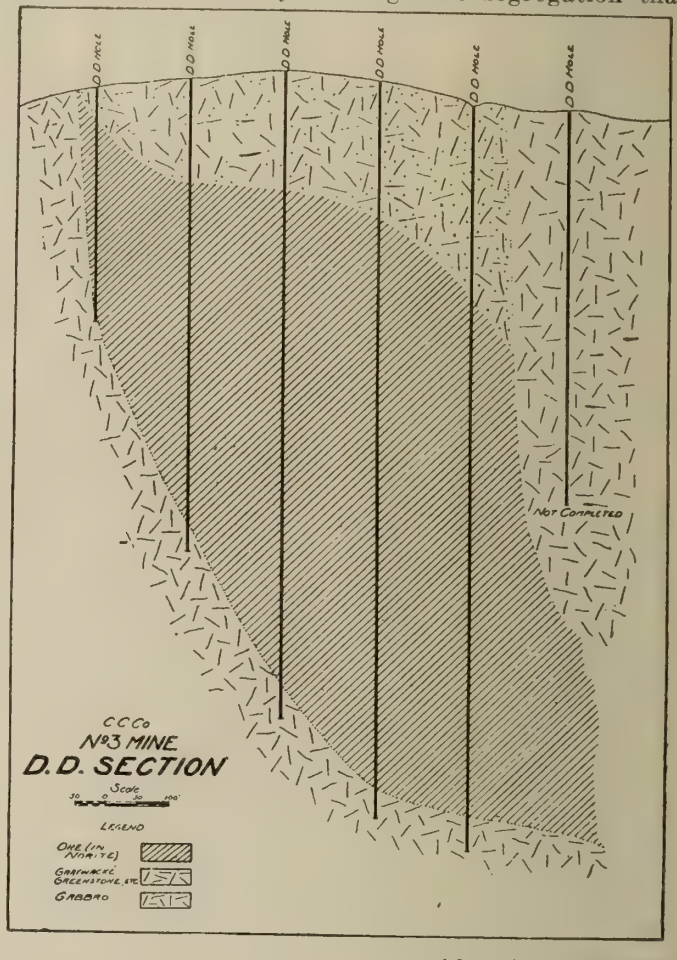
There have always been some geologists, however, who were not inclined to accept the theory outlined above. These workers preferred to believe that the ores were deposited from solutions.

Recently the theory of gravity has been questioned by C. W. Knight in an article in the Engineering and Mining Journal of May 6th. A serious objection was raised regarding this explanation in connection with the Creighton mine. It was shown by Knight that the coarse grained granite, which forms the footwall of the mine, is younger than the norite—the latter forming the hanging-wall. If this is true it is clear that the settling of the sulphide in the molten norite by means of gravity, so that they came to rest on the granite footwall, did not take place.

Less than two years ago the gravity segregation theory was discarded by E Howe† as an explanation of the origin of the Creighton orebody. He pointed out the fact that the norite near the contact with the ore is fine grained. He found it difficult to understand how this fine grained texture could develop where the cooling norite was separated from the footwall by a mass of molten sulphide. He also noted that the norite, at its contact with the orebody, was invariably brecciated for a distance of 3 to 12 ft. from the contact. The norite fragments in this brecciated zone were found to be cemented together by the sulphide. He considered, therefore, that the sulphides were evidently formed after the norite had solidified, and he suggested that they were introduced in a molten condition as a later intrusive.

There are other objections to the gravity segregation hypothesis. Some years ago, for instance, F. D. Adams‡, though a believer in this theory, pointed out that, while the hypothesis suggested that the sulphides settled to the bottom of the molten norite, it was a curious fact that the iron ores in some unaccountable way did not settle, although magnetite is invariably present in the norite. The amount of magnetite in the ore is stated by A. E. Barlow to be about 1 per cent. Rarely does it exceed that amount, except in one or two instances cited by A. P. Coleman. There are no large deposits of magnetite associated with norite in the entire nickel field.

It appears, indeed, that there are so many valid objections to the theory of magmatic segregation that




---After A. P. Coleman

perhaps geologists must after all revise their ideas regarding the origin of the Sudbury nickel-copper ores. Theoretically the idea is a beautiful, and, at the same time, a very plausible hypothesis; but its application to the orebodies meets with serious difficulties. The Canadian Mining Journal will welcome any discussion regarding this interesting subject, particularly if new points of view are brought forward.

## CONIAGAS.

The Coniagas will instal a 100 ton a day flotation plant. The machinery and other equipment has been ordered, and it is expected that the plant will be in operation in about six weeks. The plant will be along the lines of the plant installed at the McKinley-Darragh. It will operate behind the tables. Tanks will not be put in just now and the slimes will run direct to a mixer, then to the cells.

* Ore Deposits, by Beyschlog, Vogt and Krusch, 1914, Vol. I., page 292.
† Economic Geology, Vol. IX., September, 1914.
‡ Journal Canadian Mining Institute, Vol. IX., 1906, page 234.

## RECENT DEVOLOPMENTS IN THE SUDBURY DISTRICT

The Murray mine, which is owned by the British American Nickel Co., is being unwatered, and it is expected that operations will start in the near future. Mr. George Johns, formerly of the Dome mines, is at present in charge of the property. It is expected that the construction of the smelter and refinery will be started in the course of a few months.

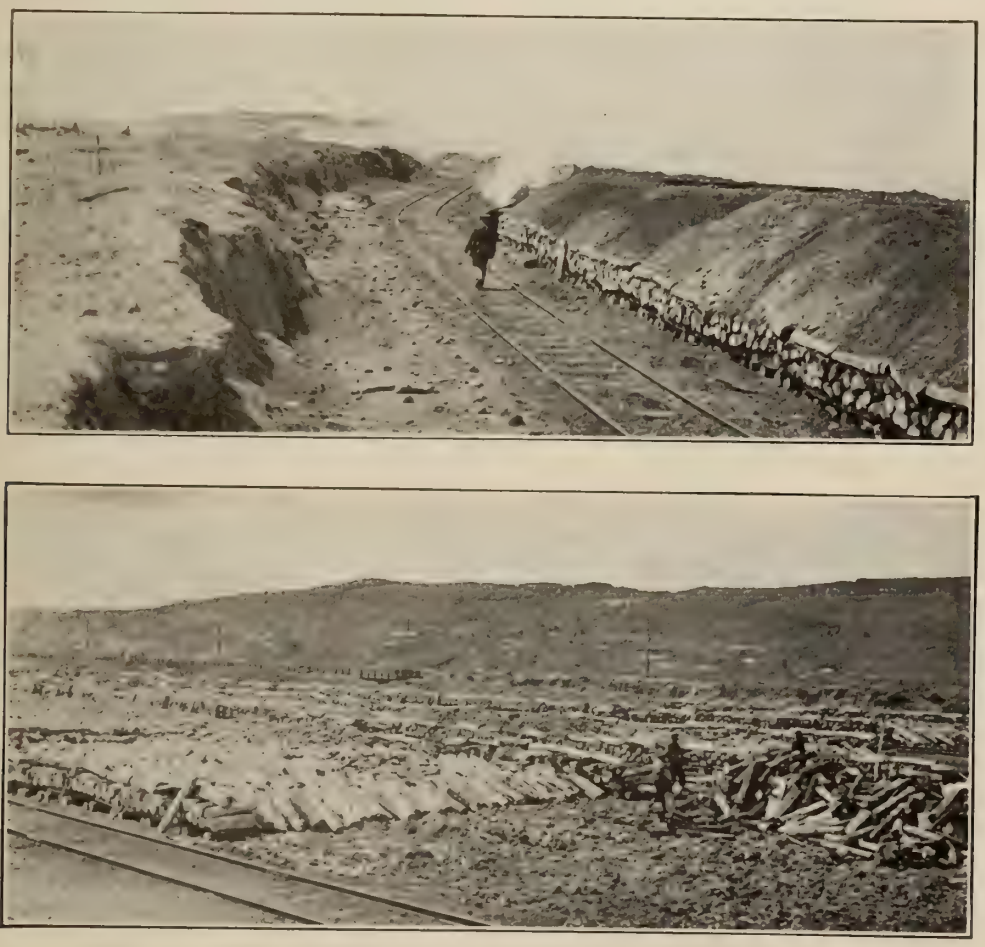
Considerable construction is going on at Creighton mine. Fifty odd residences are in the course of construction, and a new club is to be built and a new business block is projected. The town is becoming one of the largest in the district and the streets are being improved and sidewalks extended around the town. The trolley system has not yet been extended from Copper Cliff to Creighton, but no doubt this will be done in the course of another year.

The new steel headframe and rockhouse at the Creighton mine are nearing completion, and it is thought that they will be ready for use within the next six months. It will take considerable work to get the shaft in shape for hoisting by this time, as all the concreting has to be done and the latter has not been started yet. It is planned to push the work. A trestle will be run from the new rockhouse to the open pit, and the waste rock will be disposed of in this way, being dumped into the open pit. The new power house is completed and ready for the installation of machinery. The shops are completed. A large underground crusher is being installed.

Foundations for the new office building have been started. This will house all the various departments and will be equipped with an excellent draughting room.

At Copper Cliff the new Recreation Club is in use. This is fitted as fine as any of the best clubs in our large cities and is provided with a swimming pool and other apparatus for amusement. Certain days are reserved for the ladies, so that the wives of employees as well as the employees themselves may take advantage of the fine building. A nominal fee is charged employees for their membership. Outsiders are permitted to join, but are charged an initiation fee.

The beds at the old roast yards of the Canadian Copper Co., at Copper Cliff, are burning out, and no new beds are being put down here. Beds are being put down at the new roast yards at mileage 17 on the Algoma Eastern Railway. This makes a much longer haul for the ore, as it must be hauled from Creighton South to the roast heaps and the roasted ore has to be hauled back north to Copper Cliff to the smelter. It frees Copper Cliff and Sudbury from the sulphur fumes, but the smoke seems to be causing considerable damage to the property along the C.P.R. (Soo branch) and Nickel City, that was the pleasure resort of the district, is suffering. tI will probably not be long before this part of the country will be as devoid of foliage as the parts around Copper Cliff are at present.



Roasting nickel-copper ore

The nickel question is a big thing now in all parts of the country, and it is only natural that the people of Sudbury are especially interested, since this industry is so all important to the town. The town is naturally very desirous of having the projected refineries located in the vicinity, and resolutions have been introduced to have both the International and the Brit-

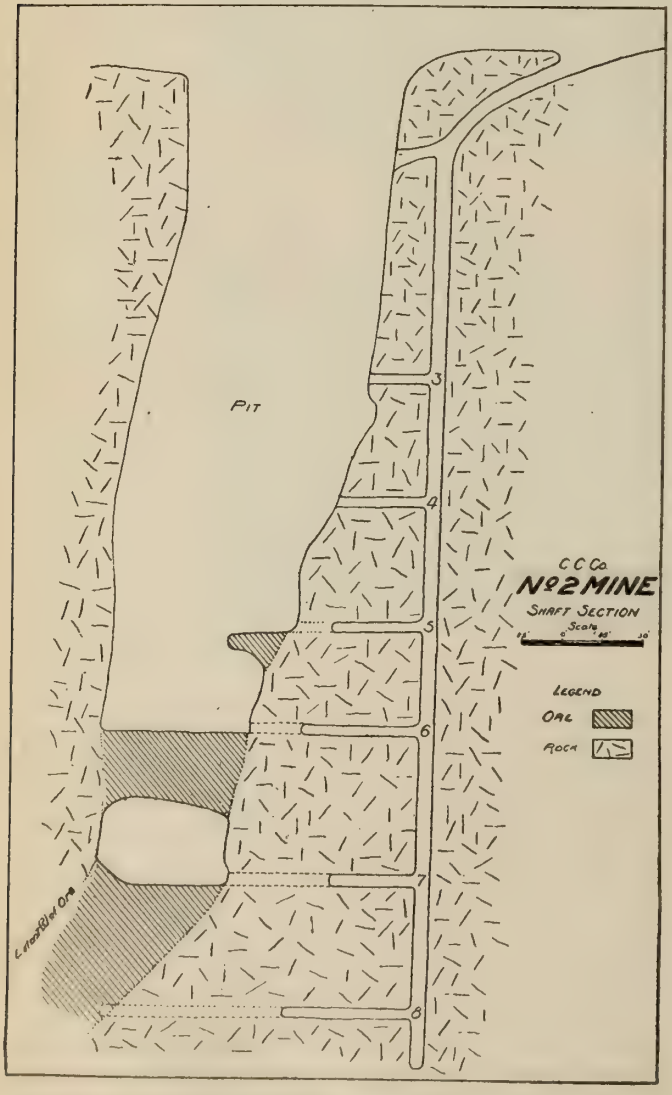
ish American companies consider Sudbury for the smelter and refineries.

F. Black, M.P., is interested in a company known as the Sudbury Nickel Refineries, with headquarters at Ottawa. The process is supposed to make nickel steel direct from iron and nickel ores.

Mr. P. Kirkegaard has made an examination of the property and mill of the Sable River Copper Co., located at Massey, Ont. Mr. Jas. Flynn is president of the company, and Mr. A. E. Hall is superintendent. The ore is chalcopyrite, and is being concentrated by flotation methods. Several cars of ore have been shipped to the smelter, as well as several cars of concentrates from the mill. While the company is reorganizing operations are temporarily discontinued.

Mr. Robert Bryce has made an examination of the Sable River Copper Co.'s mine and mill. Mr. J. Johnson, of Mine Centre, visited the Sable River Copper mine the past week. He is interested in seeing what ore could be depended upon for the erection of a smelter at the Soo or other convenient place ,and is himself interested in a chalcopyrite property at Mine Centre, west of Fort William.

The forest fires that have been taking such a toll up north have not been very severe in the Sudbury district ,although they have been felt. The Canadian Copper Co. lost a large quantity of wood, and there are many fires burning along the Soo branch of the C.P.R. The town of Blind River suffered heavily.




A Sudbury Nickel Copper Deposit--After A. P. Coleman

## THE INTERNATIONAL NICKEL COMPANY.

### Consolidated General Balance Sheet, June 30th, 1916.

Assets.

| | |
|---|---|
| Property | $43,679,367.94 |
| Investments | 1,510,033.87 |
| Inventories | 4,649,941.34 |
| Accounts and bills receivable | 2,246,387.22 |
| Loans on call | 1,015,000.00 |
| Certificates of deposit | 2,030,000.00 |
| Cash | 4,137,633.15 |
| | $59,268,363.52 |

Liabilities.

| | |
|---|---|
| Preferred stock | $8,912,600.00 |
| Common stock | 41,834,600.00 |
| Accounts payable | 1,728,186.94 |
| Preferred Dividend No. 43, payable Aug. 1st, 1916 | 133,689.00 |
| Accident and insurance funds | 193,208.08 |
| Surplus April 1st, 1916 | 3,294,194.67 |
| Profit and Loss (balance as per statement) | 3,171,884.83 |
| | $59,268,363.52 |

### Consolidated General Profit and Loss Statement.

3 Months ending June 30th, 1916.

| | |
|---|---|
| Earnings | $3,959,134.58 |
| Other income | 66,261.89 |
| Total income | $4,025,396.47 |
| Administration and general expense | 222,422.35 |
| Net income | $3,802,974.12 |
| Depreciation and mineral exhaustion | 497,400.29 |
| Profits | $3,305,573.83 |
| Dividends— | |
| Preferred No. 43, payable Aug. 1, 1916 | 133,689.00 |
| Balance | $3,171,884.83 |

New York, July 24th, 1916.

## MOND NICKEL.

At the annual meeting of the Mond Nickel Co., Ltd., which operates extensively in the Sudbury district, held in London this month, the chairman of the company, Right. Hon. Sir Alfred Mond, Bart., M.P., said that profits during the year were £322,000, the progress was the most satisfactory, and that the mines were developing beyond expectations. The company had never been given any special encouragement to develop their supplies for war needs and had gone through a prolonged struggle to get permission to have used in British armaments the only nickel manufactured within the Empire. The regular 7 per cent. dividend on the preferred stock was paid and 20 per cent. dividend for the ordinary shares.

The officers and directors of the Hudson Bay Zinc Mines Co., operating the Hudson Bay group of mines on Deer creek, in the neighborhood of Salmo, Nelson mining division of British Columbia, following the purchase of the control of that company by a syndicate organized by Hayden, Stone & Co., of New York City, are as follows: President, M. W. Bacon, Spokane, Washington; vice-president, James A. Nelson, New York; secretary, A. T. Ronaghan, New York; treasurer, W. E. Cullen, Spokane; other directors, W. Bruce McKelvie, Thos. J. Ryan and Nash Rockwood, all of New York.

# NICKEL STEELS

By Henry D. Hibbard.

Alloy steels are bringing about a series of revolutions in various industrial fields in which steel plays an important part. Most elements that could be procured in sufficient quantity have been alloyed with iron in various proportions, either alone or in combination with others, in the search for useful alloy steels.

Probably the first useful alloy steel was Mushet's self-hardening tungsten tool steel, patented in 1868. Fifteen years later chromium steel, really containing chromium, was struggling for recognition for some purposes, the chief of which was for the manufacture of solid shot for piercing armor. In both of these steels the effect of the alloying element as used was in a way proportional to the amount contained. In 1882 Hadfield made his epoch-making discovery of manganese steel and demonstrated that in iron metallurgy it is not safe to take for granted anything as to the properties of an alloy of iron with other elements, basing one's opinion on past experience and knowledge, and that the effect of an alloying element may not be proportional to its content. The development of useful nickel steels followed in a few years and the field thus opened has since then been worked by many able and zealous men, with results of great importance and value.

### Simple Nickel Steels.

Nickel steel was chronologically the fourth alloy steel to be introduced, it having been in use for 25 years, and the steels to which nickel is added aggregate a large tonnage. In 1913, including the nickel-chromium steels as well as the simple nickel steels, the total amount of steel produced to which nickel was added was about 150,000 tons in the ladle, of which about 50,000 tons was simple nickel steel. The field for the latter is being steadily narrowed by the substitution of the cheaper or better nickel-chromium steels.

The useful nickel-iron alloys range, with large intervals, from 2 to 46 per cent. of nickel, a greater compass than is covered by any other element alloyed with iron. The addition of less than 2 per cent. of nickel alone does not seem to give enough benefit to make the addition worth while.

Nickel in untreated ordinary nickel steel raises the tensile strength, and in a greater proportion the elastic limit for a given content of carbon without decreasing the ductility.

### Manufacture of Simple Nickel Steel.

Nickel steel is made by any of the steel-making processes, but most of it is produced in the open-hearth furnace. The operations are similar to those followed in the production of simple steels, the nickel being either in the materials of the original charge or added in the metallic form at any time long enough before the heat is cast for the nickel to be melted and thoroughly mixed with the metal of the charge. Nickel is negative to iron at steel-melting temperatures and the iron protects it from oxidation and even reduces it from its oxide so that it is not wasted to any considerable extent in melting or working even when iron ore is added to the bath. On the other hand it does not deoxide the metal or decompose carbonic oxide or keep the hydrogen and other gases in solution. It is not added, therefore, for curative purposes as it gives no aid in rendering steel sound, or free from holes. In fact, nickel steel is prone to have seams and surface defects after it has been rolled, which is one reason against its wider use. The service of nickel is merely as an alloying element, to improve the physical properties of the finished steel either in its natural or heat-treated condition.

As might be expected from an alloying metal whose atomic weight, specific gravity, and fusion are so near those of iron, nickel does not segregate much as the steel solidifies, and is claimed to hinder in some degree the segregation of carbon and the other less metallic ingredients. A reasonable explanation of this action of nickel on the other elements has not yet been established.

### Working of Simple Nickel Steel.

Ordinary simple nickel steel (3 to 4 per cent. nickel) is worked hot by the usual forging and rolling operations much as simple steel is worked. The higher nickel steels are more difficult to work, having narrower ranges of temperature at which they may be hot-worked without showing signs of redshortness. In the ordinary grades seams and adhering scale give some trouble.

Although molten iron protects molten nickel from oxidation, iron can not protect nickel from oxidation in scale formed on nickel steel, as in the heating furnace. The scale formed sticks much more firmly to the metal than that of simple steel both hot and cold and requires particular measures for its removal. Articles such as plates, having large flat surfaces from which the scale can not escape even if loosened by such means as rolls or the flat dies of the forging press, are sometimes cleaned cold by electrically driven machines which break up the scale by a shower of blows with chisels or hammers. A round article is much more satisfactorily cleaned of scale by the forging operation, as the metal is worked while not in contact with the dies, and the scale is thereby loosened and falls off. The scale naturally escapes more easily from the under side of a rolled plate than from the top in rolling, and some mills are equipped with apparatus for turning the plate bottom up before it is finished, so that the scale which has been repeatedly loosened and then rolled in again by the rolls can drop off when loosened from the under side.

Steels containing useful quantities of nickel are liable to contain seams that appear as dark-colored lines in the metal. The seams doubtless come, sometimes at least, from "skin" gas holes which become oxidized on their walls, and, although such oxidized holes will, if present, form seams in any steel, they seem to persist more in nickel steel because, perhaps, the nickel prevents the welding of such holes, as may happen with holes in simple steels if they are squeezed together while hot enough and the walls are clean and not oxidized. A hole near the surface in nickel steel might conceivably, therefore, be drawn out and the slit formed be opened to the air by the hot working, then oxidized on its inner surface, and form a seam, when a similar hole in simple steel would be welded and therefore not form a seam. Nickel-steel ingots should therefore be made sound and free from gas holes. It is held by some persons that seams develop in rolling without being caused by gas holes, and that this tendency is lessened by rolling at a high temperature, about 1,300 deg. C. (2,372 deg. F.).

* Extracts from a report on Alloy Steels published by the U. S. Bureau of Mines.

### Nickel Steel for Structural Purposes.

The great bulk of simple nickel steels contain from 2 to 4 per cent. of nickel, a proportion that affords the most suitable properties for nearly all structural purposes, and the nickel content usually aimed at in steels for structural purposes is 3.25 per cent. This grade might be called ordinary nickel steel as it is usually meant when nickel steel is mentioned without further specification. It has high value for structural purposes such as bridges, gun forgings, machine parts, engine and automobile parts, and any similar line of service that is too severe for simple steels.

The bridges in which it is used are particularly those of great span, and it is nearly always used in the natural or annealed condition when the additional strength and ductility imported is that due to the mere presence of nickel in the metal. Important quantities are used in the Queensboro, Manhattan, St. Louis Municipal, and Quebec bridges, and the Kansas City viaduct. Some nickel-steel tension bridge members have been heat treated by heating and quenching, being immersed in water edgewise with the longitudinal axis horizontal, and afterward drawn back by a second heating to give an elastic limit of 55,000 pounds per square inch, a rather low figure. A relatively low percentage of nickel, or about 2 per cent., is sufficient to afford steel with such a property, when heat treated.

The use of nickel steel in bridges saves some weight, a detail of importance in such bridges as those mentioned, but when the span is moderate a bridge of simple steel is perhaps as good and is less costly even though it contains considerably more weight of metal.

Steel with 2 per cent. of nickel is used in seamless tubes such as are used for bicycles and for other equipment requiring a high-grade tube. They are not heat treated, but higher properties than those of the steel in its natural state are imparted by the cold-drawing operations by which these tubes are finished.

The ordinary grade with 3.5 per cent. nickel is used in cannon, being always heat treated for this use. It is also used in many automobile parts, the variety of high properties obtainable in it by modifying its heat treatment rendering it fit for almost any service demanding a strength and security from breakage that a simple steel will not meet.

In some large dynamos the revolving fields are connected by nickel-steel rings having 3 per cent. nickel, the metal being particularly well suited for the purpose both by its strength and its magnetic efficiency, the permeability being high and the hysteresis losses low.

### Nickel Steels Used in Rails.

Nickel-steel rails usually having about 3.5 per cent. of nickel have been tried by many railroads and are generally considered unsatisfactory though small lots are still being made chiefly for use in tunnels and other unusually wet or damp places, both for their ability to resist rusting and for safety from breakage. Their price is nearly twice that of simple steel rails and they sometimes give three times the service but their average life has been much less than that. One lot of Bessemer nickel-steel rails which gave between one to two times the service of simple Bessemer steel rails wore unevenly and the metal flowed over the side of the head on the curve so that it was finally detached in thin splinters, some of which were 3 or 4 feet long. The rails from the upper parts of the ingots were more unsatisfactory than those from the bottom and though the ingots were not examined for their soundness it seems evident that their upper parts were infested with blowholes as well as pipe, and that none of the holes or pipe were welded up in rolling, as the effect of nickel in hindering welding of steel is well established.

### Properties of Ordinary Nickel Steel.

The properties of ordinary nickel steel are given below. All the samples consisted of small test pieces, and elongations were measured on 2 inches except as noted.

**Properties of Ordinary Nickel Steels.**

| Sample No. | Composition. C. Pct. | Mn. Pct. | Si. Pct. | S. Pct. | P. Pct. | Ni. Pct. | Condition. | Physical Properties. Tensile strength. Pounds. | Elastic limit. Pounds. | Elongation. Pct. | Contraction. Pct. | Ball hardness. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1a | 0.28 | 0.57 | .... | 0.03 | 0.02 | 3.44 | Natural state.. | 95,420 | 56,670 | b21.2 | 40 | ... |
| 2c | .40 | .64 | .... | .02 | .01 | 3.43 | Annealed. . . . . | 98,800 | 51,400 | d12.4 | 33 | ... |
| 3c | .40 | .55 | .... | .03 | .01 | 3.70 | " ..... | 93,180 | 56,060 | d15.8 | 40 | ... |
| 4e | .20 | .65 | .... | .04 | .04 | 3.5 | " ..... | ..... | 43,000 | 27 | 62 | 170 |
| 5e | .20 | .65 | .... | .04 | .04 | 3.5 | (f). . . . . | ..... | 95,000 | 20 | 72 | 216 |
| 6e | .20 | .65 | .... | .04 | .04 | 3.5 | (g). . . . . | ..... | 140,000 | 14 | 61 | 330 |
| 7e | .30 | .65 | .... | .04 | .04 | 3.5 | Annealed. . . . . | ..... | 63,000 | 27 | 63 | 163 |
| 8e | .30 | .65 | .... | .04 | .04 | 3.5 | (h). . . . . | ..... | 87,000 | 25 | 68 | 207 |
| 9e | .30 | .65 | .... | .04 | .04 | 3.5 | (i). . . . . | ..... | 123,000 | 15 | 57 | 269 |
| 10e | .30 | .65 | .... | .04 | .04 | 3.5 | (j). . . . . | ..... | 187,000 | 13 | 57 | 405 |
| 11k | .25 | .74 | 0.21 | .01 | .01 | 3.55 | (l). . . . . | 207,000 | 177,000 | 14 | 60 | 395 |
| 12k | .25 | .74 | .21 | .01 | .01 | 3.55 | (m). . . . . | 135,000 | 117,000 | 20 | 67 | 267 |

a Sample represented untreated steel for Quebec bridge.
b In 8 inches.
c Full size eyebars for St. Louis Municipal Bridge.
d In 18 feet.
e Figures taken from fourth report of Iron and Steel Division: Bull. Soc. Automobile Eng., Vol. 4, 1913, p. 168.
f Quenched in water at 850 degrees C.; hardness drawn in air at 538 degrees C.
g Quenched in water at 800 degrees C.; hardness drawn in air at 316 degrees C.
h Quenched in water at 800 degrees C.; hardness drawn in air at 593 degrees C.
i Quenched in water at 800 degrees C.; hardness drawn in air at 309 degrees C.
j Quenched in water at 800 degrees C.; hardness drawn in air at 316 degrees C.
k Figures furnished by Halcomb Steel Co.
l Quenched in water at 843 degrees C.; hardness drawn in air at 316 degrees C.
m Quenched in water at 843 degrees C.; hardness drawn in air at 538 degrees C.

One per cent. of nickel in ordinary nickel steel in the natural state raises the tensility about 6,000 to 8,000 pounds per square inch.

The table shows that ordinary nickel steels may be so made as to have a wide range of properties that make them suitable for any structural purposes for which they are not too expensive.

The properties of one grade of nickel-steel castings made for special purposes are as follows: Composition, C 0.20 per cent., Mn 0.50 per cent., Si 0.35 per cent., Ni 2.50 per cent.; tensile strength, 85,000 pounds per square inch; elongation, 25 per cent.; contraction, 40 per cent. This steel was not given treatment involving quenching but was merely annealed.

Steel containing 5 to 8 per cent. of nickel presents a sort of critical point, that proportion being the lowest at which, with the usual range of carbon, the structure is all martensitic and consequently very hard, the martensitic state being equivalent to the hardened state of simple steels. Such steel is difficult to work hot or cold but can be rolled if proper care is used. It finds some usefulness in places where great resistance to shock is required, particularly in thin shield plates about 0.15 inch thick which are used on one side of the caisson of field artillery to protect the ammunition, and the men who serve it, from rifle fire. A sample analyzed for "Tests of Metals" (War Department, 1908) gave the following composition in percentages: C 0.42, Mn 0.49, Si 0.26, S 0.02, P 0.02, Ni 6.68.

The content of carbon determines the minimum amount of nickel which must be present to make the steel wholly martensitic. Thus if the carbon content is low, about 0.20 per cent., 8 per cent. of nickel is required, whereas if the carbon content is about 0.80 per cent. the steel is martensitic when there is 5 per cent. of nickel contained. The analysis given last above represents martensitic steel.

Guillet gives the properties of a similar steel, with 6 per cent. of nickel and 0.38 per cent. carbon, as follows:

**Properties of Nickel Steel containing 6 per cent. of Nickel.**

| Condition. | C. | Ni. | Tensile strength. | Elastic limit. | Elongation. | Contraction. | Shock. |
|---|---|---|---|---|---|---|---|
| | Pct. | Pct. | Pounds. | Pounds. | Pct. | Pct. | |
| Annealed | 0.38 | 6.0 | 113,760 | 99,540 | 20 | 65 | 30 |
| Air hardened at 850 deg. C. | .... | .... | 177,750 | 156,420 | 11 | 53 | 19 |
| Quenched in water | .... | .... | 199,080 | 177,750 | 10 | 50 | 17 |

He does not say whether this steel was martensitic, but the high elastic limits indicate that it was probably largely so, even in the annealed condition.

Steel with 8 per cent. nickel has one transformation point at 510 deg. C. (950 deg. F.) where points $Ar_3$, $Ar_2$, and $Ar_3$ are all merged into one. Eight per cent. is the highest useful content of nickel in nickel steel that is amenable to ordinary annealing and quenching operations. Hardening by quenching does not occur in steels containing 10 per cent. or more of nickel which are on the contrary softened by heating and quenching.

**Nickel-Iron Alloy Discovered by Arnold and Read.**

The 13 per cent. nickel-iron alloy with 0.55 per cent. carbon discovered recently by Arnold and Read is noteworthy as it seems to possess the highest strength of any of the nickel steels. It is so hard as to be unmachinable and the investigators mentioned were not able to drill it even to get some drillings for analysis, the composition mentioned being what they aimed at when making the steel. It has a yield point of about 134,000 pounds per square inch, a tensile strength of about 195,000 pounds, with 12 per cent. of elongation in 2 inches. This gives a merit figure of about 2,300,000 which is very high for such a hard steel though it does not compare with the 7,000,000 of forged manganese steel. Steel of this composition might have been expected to show maximum strength as a result of Hadfield's experiments, though he did not include this grade in his series of samples. He found that low-carbon steels with 11.4 and 15.5 per cent. of nickel each had a tensility of 210,560 pounds, which was more than was possessed by the steels next above and below. The curve therefore should have reached a maximum between them with a nickel content of about 13.5 per cent.

Arnold and Read's steel should, of course, have a higher tensility, or about 215,000 pounds, to harmonize with Hadfield's, and further tests are needed to establish the exact path of the curve. Arnold and Read note that the composition of this steel nearly corresponds with the formula $Fe_7Ni$. With such properties as it possesses this steel is likely to find at least a limited field of usefulness.

**Other Nickel Steels.**

Before Arnold and Read's discovery of the 13 per cent. grade, 15 per cent. nickel steel was thought to have the greatest strength of all the nickel steels—that is, in the natural state. This variety has been employed in a few instances for shafting and similar service for which other steels failed, but the amount of it used is negligible in statistics. It is hard to machine, and heating followed by slow cooling does not soften it, though heating and quenching does enough to allow it to be machined slowly. It has a tensility of about 170,000 pounds and an elastic limit of 150,000 pounds per square inch, according to one observer, though, as stated above, Hadfield obtained 210,560 pounds tensility, with little ductility. It is likely that the properties desired when this steel was used, particularly its ductility, could now be surpassed by the much cheaper heat-treated ordinary nickel or nickel-chromium steels.

Eighteen per cent. nickel-iron alloy, although not useful, is worthy of note here because of its anomalous action (according to Sexton and Primrose) when cooled from 200 deg. C. (392 deg. F.). At first it contracts uniformly until its temperature falls to 130 deg. C. (266 deg. F.). Then it expands while cooling to 60 deg. C. (140 deg. F.), when it again contracts as the temperature falls farther.

Twenty-two per cent. nickel steel is used when resistance to rusting or corrosion is desired. A noted example is the valve stems of the salt-water fire-protection service of the city of New York where the apparatus may not be allowed to become inoperative or hard of action from the formation of rust. It is also sometimes used for the spark poles in the spark plugs of internal-combustion engines, including automobiles, though commercial nickel wire is more commonly used.

High-nickel steels having 25 per cent. or more of nickel and low carbon content (about 3 per cent.) are austenitic in structure and in the natural state are softer and tougher than the medium-nickel martensitic steels.

High-nickel steel containing 24 to 32 per cent. nickel in the form of wire is used for electrical resistance in small quantity, probably between 5 and 10 tons per year in this country.

The analysis and resistance of samples of Krupp nickel-steel resistance wire are shown below. This wire is used in electric toasters, cookers, irons, and similar devices.

Steel with 27 per cent. of nickel is used in bits, stirrups, and spurs in riding harness because of its resistance to rusting. It will nevertheless rust slowly at ordinary temperature under conditions that strongly induce oxidation.

Steels containing more than 24 per cent. of nickel are practically nonmagnetic in their ordinary condition, a rather remarkable fact when the high magnetic susceptibility of both iron and nickel alone is considered. The explanation that the critical point marking the change from the nonmagnetic to the magnetic state of iron is lowered by the nickel from about 700 deg. C. (1,292 deg. F.) to below ordinary atmospheric temperatures is, no doubt, sound as far as it goes. When 25 per cent. nickel steel is cooled to —40 deg. C. (—40 deg. F.) it becomes magnetic, and retains its magnetism at ordinary atmospheric temperatures. On being heated to 580 deg. C. (1,076 deg. F.), however, the alloy reverts to the nonmagnetic state. This separation of 620 deg. C. between the critical points marking the magnetic states in heating and cooling is great in comparison with the 25 deg. to 50 deg. C. of simple steels, and because of it this steel is classed as irreversible.

The nonmagnetic quality of high-nickel steels is not utilized chiefly because of its capacity for becoming magnetic, as described above, for if it happened to be cooled enough to make it magnetic it could not in most cases be easily demagnetized.

The fact that high-nickel austenitic steels have a somewhat lower modulus of elasticity than the low-nickel or simple steels does not affect their value for the uses made of them. These steels also have low elastic limits though they are tough and show up well in the shock test. Nevertheless they are generally used not because of superior physical properties but because of their resistance to rusting and corrosion or their electrical resistance. With a carbon content of 0.25 to 0.30 per cent. and 32 per cent. nickel they are used in valves for gasoline motors with good results.

Nickel steel with 30 per cent. of nickel is used in boiler tubes, particularly in marine boilers, for which it is admirable. These tubes are in the natural, not heat-treated state. They resist corrosion better than simple steel tubes and last three times as long. Hence their use is sometimes economical in spite of the much higher cost.

### Invar.

The 36 per cent. nickel steel known as Invar is used to the extent of perhaps a few hundred pounds a year in clock pendulums, rods for measuring instruments, and such parts for which its exceedingly slight expansion and contraction when heated and cooled within the atmospheric range gives it a particular value. Nevertheless, its coefficient of expansion, even though small, is not negligible, and compensating means must be used in Invar clock pendulums and in the Invar balance-wheels of watches. A watch with an Invar balance-wheel varied 20 seconds per day during a temperature change of 40 deg. to 90 deg. F., the usual test change, a variation too great for a good watch. Some Invar has as low a coefficient of expansion as 0.0000008 per degree centigrade, and samples have been made that contracted slightly when warmed. The coefficient given indicates an expansion of 0.05 inch in a mile per degree C.

When Invar is heated to about 300 deg. C. (572 deg. F.) and higher its coefficient of expansion is greatly increased and its lack of expansion at ordinary temperatures appears to be merely a belated and not destroyed function. With excessive cold there is likewise a resumption of contraction.

### Platinite.

Forty-six per cent. nickel steel with 0.15 per cent. carbon known as platinite, has about the same coefficient of expansion as platinum and glass and for that reason may be imbedded in glass without breaking the latter by a difference in expansion. It has been used in leading wires in the glass bases of electric incandescent lamp bulbs as a substitute for platinum which was formerly held to be indispensable. In those lamp bulbs the preservation of the vacuum is necessary and the joint between the wire and glass must be kept tight. Platinite has not been found wholly suitable for this purpose and is not now so used, a compound wire with a 38 per cent. nickel-steel core encased in copper and sometimes coated with platinum now being generally employed. The nickel-steel core if free will expand less than the glass and the copper more, so that each resists the other and the wire as a whole will have the desired rate of expansion. About 2 tons of nickel steel per year is used in this wire.

Many other alloys of iron and nickel have been studied by Guillet and others. In fact the whole range has received more or less thorough attention, and much knowledge of scientific value has been gained concerning the varieties that so far have not found useful application.

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## NICKEL-CHROMIUM STEELS

Nickel-chromium steels known in the trade as chrome-nickel steels are perhaps the most important of the structural alloy steels. Their field of usefulness is continually being enlarged by their application for new purposes and also by encroachment on the premises of some of the other alloy steels, notably of simple nickel steel, and they have almost wholly displaced nickel-vanadium and nickel-chromium-vanadium steels, which several years ago were in some considerable demand.

The amount of nickel-chromium steels produced in 1913 was thought to be about 100,000 tons of ingots, all made in the open-hearth furnace with the exception of 2,000 or 3,000 tons melted in crucibles and electric furnaces. The steel is made by 10 or 12 companies, 2 of which make it at several different plants.

Nickel-chromium steels are seldom used in any but a heat-treated condition. By suitable treatment pieces of small mass can be made to have as high physical properties as any steels known, with any elastic limit between 40,000 and 250,000 pounds per square inch, accompanied by ductility that is high as compared with its strength, as the ductility naturally lessens as the elastic limit increases.

Nickel-chromium steels can be made somewhat more cheaply than simple nickel steel of the same strength and ductility containing a smaller total of the alloying elements, and chromium is less costly than nickel.

Most of the nickel-chromium steel goes into armor plate, projectiles, and automobile parts.

For automobiles—and the practice might be advantageously extended to other fields—three grades of nickel-chromium steel are used. They are called low, medium, or high according to their contents of nickel and chromium. The carbon content may be varied for each grade within the limits shown in the following table:

**Analysis and Resistance of Samples of Krupp Nickel-Steel Resistance Wire.**

| Sample No. | C. | Mn. | Si. | S. | P. | Ni. |
|---|---|---|---|---|---|---|
| | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| 1..... | 0.52 | 0.75 | 0.10 | 0.035 | 0.024 | 30.6 |
| 2..... | .39 | 1.00 | .70 | .035 | .025 | 24.2 |

These steels are almost invariably heat treated for use in automobiles, a wide range of properties being attainable by varying the heat treatment with each steel. The properties overlap those of steels of both harder and softer grades, so that a wide choice of properties is afforded as well as a choice of steels for the set of properties desired.

### Armor Plate.

An important use for chrome-nickel steel is in both thick and medium armor plate for war vessels. The thick heavy side armor, 6 to 14 inches thick, is face hardened by the well-known methods. A recent analysis of the body of a plate gave: C 0.33 per cent., Mn 0.32 per cent., Si 0.06 per cent., S 0.03 per cent., P 0.014 per cent., Ni 4 per cent., Cr 2 per cent., and its tensile properties after treatment were:

| | |
|---|---|
| Tensile strength, pounds per square inch | 101,000 |
| Elastic limit, pounds per square inch... | 77,500 |
| Elongation in 2 inches, per cent. ..... | 24 |
| Contraction of area, per cent. ..... | 60 |

The results from such a great mass of metal were excellent.

Medium armor, between 3 to 5 inches thick, is rather similar in composition. It is not face hardened, but is given high properties as a whole by the heat treatment to which it is subjected. An analysis lately made gave: C 0.30 per cent., Mn 0.34 per cent., Si 0.13 per cent., S 0.03 per cent., P 0.03 per cent., Ni 3.66 per cent., Cr 1.45 per cent.

Its physical properties were those given below as sample 1. Sample 2 represented another chrome-nickel steel made for the same purpose, containing 3½ per cent. of nickel.

| | Sample 1. | Sample 2. |
|---|---|---|
| Tensile strength, pounds per sq. inch | 119,000 | 138.000 |
| Elastic limit, pounds per sq. inch.... | 106,000 | 119,000 |
| Elongation in 2 inches, per cent..... | 22 | 22 |
| Contraction of area, per cent. ..... | 61 | 49 |

Such steel is most excellent for use on warships to form protective decks and barriers to protect from secondary battery fire. Chrome-nickel-vanadium steel is also used for this purpose.

### Projectiles and Rails.

Nickel-chromium steel is used in the manufacture of most armor-piercing projectiles.

Cubillo cites a steel for projectiles, having 0.48 per cent. C, 0.58 per cent. Mn, 0.75 per cent. Cr, 2.55 per cent. Ni, 0.40 per cent. Si, 0.04 per cent. P. A test piece quenched in oil and tempered had an elastic limit of 129,400 pounds per square inch, a tensile strength of

150,300 pounds per square inch, and an elongation of 19 per cent.

For large projectiles Girod prefers chromium-tungsten steel having 0.50 per cent. C, 4 per cent. Ni, 0 to 1.5 per cent. Cr, and 0.25 per cent. W.

It is curious that nickel is considered to improve the quality of shot although generally held to injure the quality of high-speed tool steels. In use there seems to be a parallel between the requirements of the two, except for the important and vital difference as to the required speed at which they respectively meet the metal to be penetrated. The speed of impact of the shot enables it to enter when no amount of pressure will effect the same result.

Chrome-nickel steel rails having 2 per cent. of nickel and 0.7 per cent. of chromium have been tried by several railroads, but with unsatisfactory results. They resisted wear well as compared with simple steel rails, but broke badly both traversely and lengthwise, so that they were considered unsafe and consequently were removed. They were made by the Bessemer process and were not heat treated.

### Mayari Steel.

A so-called natural chrome-nickel steel is now made from certain ores mined at Mayari, Cuba. The ores carry enough nickel to give 1.3 to 1.5 per cent. of nickel, and enough chromium to give 2½ to 3 per cent. of chromium in the crude iron smelted therefrom. When the iron is converted into steel by the pneumatic or open-hearth processes, the nickel is practically all present in the steel, but the chromium is of necessity largely wasted by being oxidized.

Steel made of Mayari iron is giving good service in rails and particularly in track bolts, which are heat treated to give the metal an elastic limit of 75,000 pounds per square inch.

Why these rails are satisfactory when other chrome-nickel steels were not has not been explained. The chief differences seem to be (1) that these Mayari steel rails have less of the alloying elements because Mayari iron is used only in part in them, and (2) that the steel is made in the open-hearth furnace.

The use of steel containing Mayari iron is increasing, and the demand is enough to induce the production synthetically of steels of the same composition by adding nickel and chromium to simple steels in the Mayari proportions.

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The Kootenay Ore Co.'s sampling works at Kaslo, Kootenay Lake, B.C., is being transformed into a silver-lead-zinc ore concentrator by Mr. M. S. Davys and associates, and it is expected will be in operation before the end of August. In one part of the mill crude ore will be concentrated and its silver, lead and zinc contents separated, and in another concentrates will be roasted to eliminate objectionable constituents and be otherwise made marketable. The mill will be a custom plant, but its chief source of ore supply is for the time likely to be the Lucky Jim mine.

### McRAE.

The McRae Mining Co., whose property is in Deloro, is going ahead with the installation of a compressor plant. The machinery is expected to arrive within the next ten days. The new plant will be of three-drill capacity. The shaft is down a depth of 25 ft., and in addition to this there have been several test pits sunk. Work has been under way on this property all through the winter.

The main shaft is about 150 ft. away from the main vein. This will be put down several hundred feet and levels established every 100 ft., and crosscutting gone on with. The Porphyry dike is from 40 ft. to 60 ft. wide. The property is located about four miles from South Porcupine. Mr. Ed. P. Montague is manager.—Cobalt Nugget.

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### DOME LAKE.

Cobalt, Aug. 5.—Mr. G. G. Thomas, manager of the Dome Lake mine, at South Porcupine, arrived back from Toronto on Thursday afternoon, where he had been purchasing machinery for the new addition to the mill to be constructed. The machinery, Mr. Thomas expects, will arrive within about two weeks. The work of erecting piers and foundations for the new mill building will be commenced immediately ,and a start will be made right away in framing the timbers, etc., for the building. The cyanidation system will be employed. The present hoist is considerably larger than is necessary for the present needs, so that when the increased mill capacity calls for a greater tonnage no change will be required. The mill, when the addition is completed, will have a capacity of 200 tons a day.—Cobalt Nugget.

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A press despatch from San Francisco, California, dated July 31, states that the United States Government suit for the recovery of $400,000 from the Western Fuel Co., operating large coal mines near Nanaimo, Vancouver Island, British Columbia, which amount is said to have been withheld illegally in connection with the importation into California of coal from British Columbia, has been postponed indefinitely by Judge Wm. C. Van Fleet in the United States District Court at San Francisco. When asked following the court session why there had been an indefinite postponement, Mr. Edward F. Jared, assistant United States attorney, said, "I understand there will be a settlement."

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The following news of the operation of the Granby Consolidated Co. in the Pacific Coast district was published in Vancouver, B.C., at the end of July: The agglomerator which has been in operation at the Granby Consolidated Co.'s smelting works at Anyox, Observatory inlet, for some time has been giving a good account of itself, by adding to the copper output at Anyox. This euipment has demonstrated its ability to extract 4 lb. of copper from each ton of fluedust at a minimum of cost. The company's mine employees now number about 400, and its smeltery hands about 200. Ore shipments from the company's mine near Valdez, Alaska, will be commenced as soon as transportation shall be available; steamers are scarce just now.

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At a meeting of the Kennecott Copper Corporation, held in New York City early in July, it was announced that cash on hand, after having paid a dividend of $4,500,000 on June 30, was $18,073,000.

# BOSTON CREEK GOLD AREA

By A. G. Burrows and P. E. Hopkins.

That part of Boston, Pacaud, McElroy and Catharine townships in the vicinity of Boston creek is spoken of here as the Boston Creek gold area. The region is situated in the district of Timiskaming, about 45 miles northwesterly from Cobalt, and is traversed by the T. and N. O. Railway. Boston Creek station, mileage 153.5, is approximately in latitude 48 deg. north and longitude 80 deg. west. By rail, Boston Creek station is 382 miles north of Toronto.

Claims were staked for gold in this area in 1906 and 1907 during the days of the Larder Lake gold rush. Again in 1913, during the activity at Kirkland lake twelve miles to the northwest, many claims were restaked and some work was done on them. Since May, 1915, John Papassimakes has had a number of men at work on what is known as the Kenzie vein, on claims L 3665 and L 5163, in the south central part of Boston township. The promising development work on the Kenzie vein attracted many prospectors to the area, and several other gold discoveries were made in the four townships. Considerable prospecting, particularly on the surface, was done during 1915, but as yet no bullion has been shipped. A railway station has



**Boston Creek Station**

been erected near the crossing of Boston creek, around which has grown a small settlement.

### General Geology.

The rocks of the Boston Creek area are all pre-Cambrian in age, the nearest younger formation being an exposure of Niagara limestone about ten miles to the south in lot 10, concession 4, Evanturel township.

The Keewatin rocks have the widest distribution, and are important since they contain gold-bearing veins. They consist chiefly of greenstones with some volcanic fragmental rocks and iron formation. A band of clastic sediments is mapped as grey schist. The original constituents are so entirely altered that many exposures may be spoken of as serpentine, hornblende and chlorite rocks. Cutting the greenstones is a felsitic rock which may be post-Keewatin in age.

### Timiskamian.

A few small, isolated patches of conglomerate schist, slate and greywacke, standing in a vertical attiude, occur along the Larder Lake road in Boston and McElroy townships. The rocks are similar to the sediments classed as Timiskamian on the map of the Kirkland Lake and Swastika gold areas. The pebbles of the conglomerate, which are elliptical in outline, consist largely of green stone and felsite and some iron formation. A grey magnesian limestone occurs both as pebbles and matrix in the conglomerate in McElroy township about a mile east of the three-mile post on the west boundary.

The Algoman rocks include batholiths and stocks of granite and syenite, and dikes of feldspar porphyry, quartz porphyry and lamprophyre. They are massive, fresh-looking and are probably Algoman in age, since similar granite in Boston and Lebel townships to the north was found cutting the Timiskamian series.

Quartz diabase dikes are rare in this area; however, they were noted cutting the greenstones and Timiskamian (?) sediments. To the northwest, in Teck township, the diabase was seen to cut the red feldspar porphyry. These dikes are classed as Keweenawan, since they are fresh looking and resemble the diabase at Cobalt.

The region has been heavily glaciated, the ice having moved in a general S. 20 deg. E. direction, astronomic.

The area lies at the northern edge of a tract of farming land, which extends from Haileybury to Round lake, and is covered in places with stratified clays, sand and gravels. At Boston Creek station one can see the vertical section of a morainic deposit which has been cut into by Boston creek. The central part of McElroy township to the east of the Blanche river is one vast area of sand, representing probably large terminal moraines and outwash plains.

### Gold Deposits.

Gold, the chief mineral sought for in the area at the present time, occurs usually native, but occasionally combined with tellurium in quartz veins and veinlets in the Keewatin greenstone and later intrusions of granite and porphyry. The veins, which have a varying strike and dip, are well mineralized with varying quantities of pyrite and molybdenite, and sometimes with chalcopyrite, galena, specular hematite, bismuthinite, gold and a telluride. The gangue consists largely of quartz of several generations, with considerable calcite and chlorite. The gold is found along the dark streaks of chlorite and calcite.

There are various types of gold deposits, viz.:

(a) Fissure quartz veins in the greenstone and porphyry, with well defined walls. Examples, Miller-Independence, McRae and Authier.

(b) Replacement veins. The country rock, including altered greenstone and porphyry, has been brecciated and partly replaced by vein-forming solutions of quartz of several generations, and by calcite and other carbonates. Example, the Kenzie vein on the R. A. P. property.

(c) A stockwork in granite and porphyry. Examples, Charest claim (McElroy township), Authier (L 4737) and Papassimakes (L 5133).

The chief deposits will be described later in the report when dealing with the gold claims.

### Pyrite.

Pyrite occurs in two narrow bands, and disseminated through the grey schist at mileage 153 on the railway in Pacaud township. About 100 ft. east of the 153-mile post, two shallow pits were sunk several years ago, and at present one can see a little pyrite on the dumps, but the deposit "in place" is covered with debris. In the deep railway cut there are two bands of pyrite 10 and 20 inches wide respectively, which will carry about 35 per cent. of sulphur; samples from each band were found to contain no gold values. The de-

posits did not appear to be large enough to work, although wider orebodies might be revealed by further trenching. Iron pyrites is used in the manufacture of sulphuric acid.

**Copper.**

Several calcite veins with some quartz, and carrying copper pyrites, occur in the vicinity of the Blanche river in the south part of McElroy township. The Jean Petit copper property, W.R. 97, in this vicinity, has been referred to by W. G. Miller and W. A. Parks. Considerable work has been done on the calcite veins, but as far as known no copper has been shipped. It is reported that gold and silver values occur with the copper.

The Dane Mining Co. has done considerable prospecting and shipped some copper ore from Teck and Lebel, adjacent townships to the north and northwest.

**Iron.**

The isolated exposures of iron formation along the Larder Lake road in Boston township represent the southern portion of the Boston township iron range. The formation consists of interbanded silica and magnetite, with some black slate. Numerous shallow test pits were sunk in 1902, but the iron proved to be too low grade to be workable at that time. The iron formation is, in places, intruded by quartz veins, some of which carry gold.

**R. A. P. Mining Company.**

The R. A. P. Prospecting, Developing and Mining Syndicate owns a number of mining claims in the area, the principle ones being L 3665 and L 5163 in the south central part of Boston township. Some work was done on these claims in 1914 by the La Rose Mining Co. Since May, 1915, Mr. John Papassimakes has had a number of men engaged in opening what is known as the "Kenzie" vein, which occurs in a massive pillow lava. The vein, which has been stripped for about 400 ft., strikes 30 degrees north of east, astronomic, and dips from 60 to 70 degrees to the south. It varies from several inches up to five feet in width, with good breaking walls on either side. Spectacular gold showings were obtained from a 28 ft. shaft on the western end of the vein and finely disseminated gold can be seen in many samples on the dump.

When the property was visited in May, 1916, the easterly inclined shaft had reached a depth of 135 ft., and 230 ft. of drifting on the vein had been done on the 100 ft. level. Development has shown the ore to occur in shoots in the vein. The vein material consists of quartz of several generations, silicified rock, reddish calcite and brecciated and partly replaced masses of reddish feldspar porphyry. The occurrence of feldspar porphyry in various parts of the workings suggests that originally the greenstone was intruded by a narrow feldspar porphyry dike, that at a later period was greatly brecciated, and impregnated with vein-forming solutions which carried the gold and other minerals. The gold occurs with a very fine-grained greenish quartz, which has the character of a replacement deposit, while the green color is due to minute inclusions of chlorite. Iron pyrites is finely disseminated in the vein, and copper pyrites, molybdenite and galena occur in minor quantity.

Thin sections of the ore show the gold to be closely associated with the sulphides in chlorite and calcite seams near the footwall part of the vein, where there is a narrow band of fine grained greenish quartz. Certain sections of the vein run as high as $25 or $30 in gold to the ton across five feet.

The property is equipped with a small plant, including a 60 h.p. boiler, 2 drill compressor and hoist.

On the east side of claim L 2631, which lies immediately northeast of that on which the main shaft is sunk, there is an irregular band of mineralized schist with quartz, about 1 ft. wide, which contains visible gold. The showing occurs where the greenstone is intruded by a dike of feldspar porphyry, and near the contact.

About one mile to the northeast, on claim L 5165, there is a red medium grained mica granite intruding the Keewatin. Cutting the granite are several narrow white quartz veins, some of which carry molybdenite and a few specks of native gold.

**Currie.**

The Currie unsurveyed claim, L 5037, is situated about one-half mile northeast of the R. A. P. property in Boston township. In the west and northwest parts of the claim are rusty schist bands heavily mineralized with iron pyrites, and cut by quartz stringers. No visible gold could be seen in place, but gold colors can be panned from the sulphides. A grab sample showing cubes of pyrite gave $2.40 in gold to the ton, while samples across two feet and three feet seven inches gave $1.60 and 60 cents respectively in gold to the ton. Some trenching has been done.

**Miller-Independence.**

This property is situated on the south half of lot 1 in the sixth concession of Pacaud. Gold was discovered on the lot by a prospector, Mr. Joseph McDonough, in July, 1915. The vein has been traced on the property for about 600 ft. in an east and west direction, and for several hundred feet easterly into Catharine township. It is narrow, averaging about a foot in width, and has a low dip to the north, usually about 20 deg. or less, at one place being almost horizontal. The vein material is milky white quartz, and the mineralization is more or less concentrated toward the foot wall side of the vein. Telluride, copper pyrites, pyrite specular iron ore and galena are observed in the quartz. Native gold occurs frequently with the telluride and other minerals in a net-like arrangement in the quartz along the foot wall. There are probably several tellurides, but so far only one, a bismuth telluride, containing some selenium, has been recognized. This telluride of a brilliant grey color appears to occur abundantly with the gold.

The country rock is mainly fine-grained pillow lava, associated with which is a coarsely grained basic rock of a hornblendic type. Along the vein there is a dike of grey feldspar porphyry which at two places is two feet wide on the hanging wall side of the vein. The porphyry was also observed on the foot wall side. It contains much calcite and other carbonates, as well as disseminated iron pyrites, and is cut by veinlets of quartz.

The vein has been prospected by means of a number of trenches and pits, from which some high-grade ore has been bagged. A shaft was being sunk to the north of the vein. The property is equipped with a small plant, including boiler, compressor, hoist and a Nissen stamp mill; and a small oil flotation plant was being constructed.

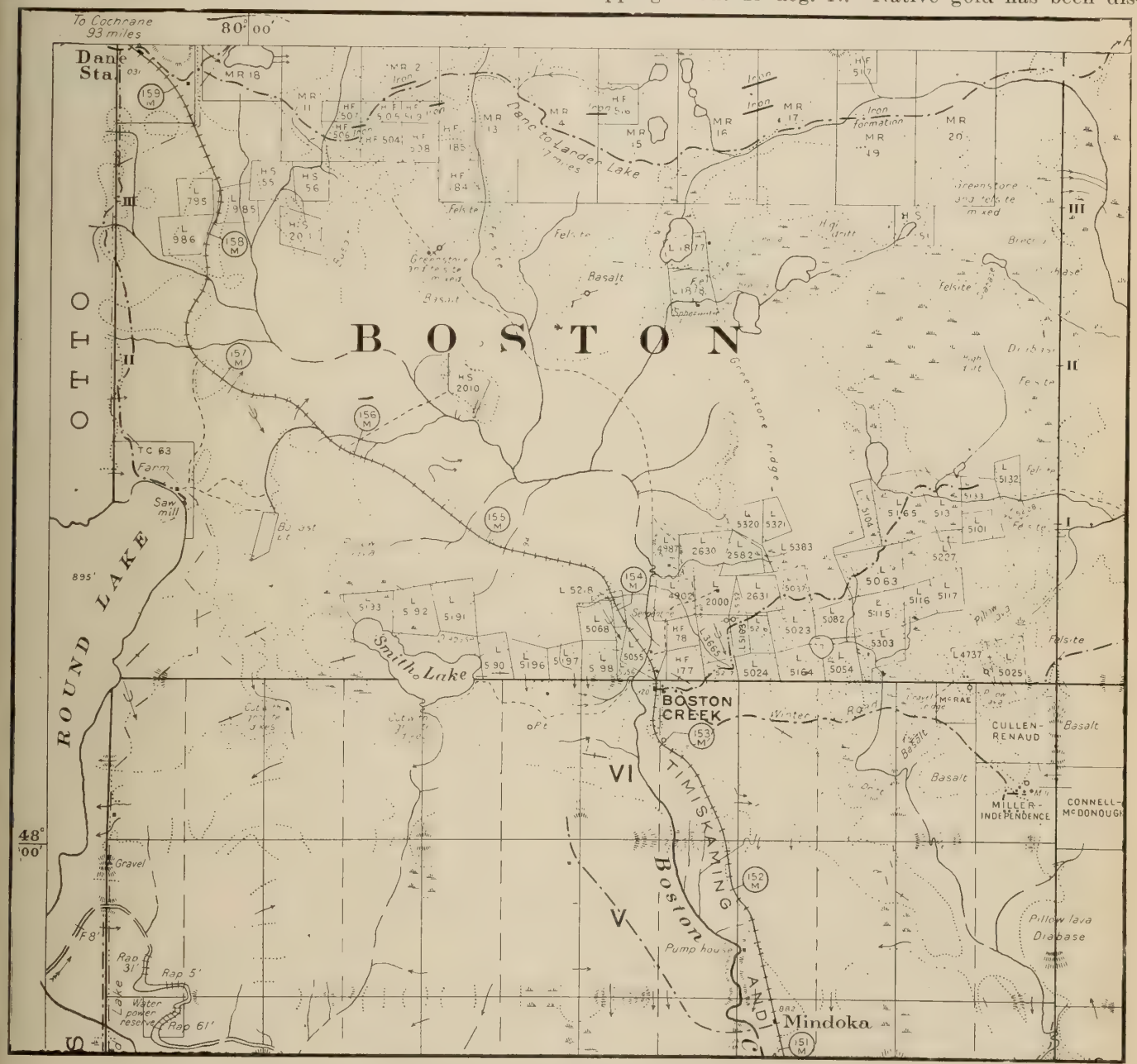
**McRae.**

The McRae claim is the northeast quarter of the north half of lot 2, concession six, Pacaud township. The vein has a general magnetic north and south strike, with a dip of about 45 deg. to the east. Fine gold can be seen in a number of places, particularly on

the hanging wall part of the milky white quartz vein, which is about one foot in width.

The country rock is pillow lava and massive greenstone showing a diabasic texture, while the wall rock is considerably altered in places next the vein. A shaft is being sunk on the vein to the 100 ft. level. Exposed in the shaft the vein has a somewhat banded structure, showing streaks of dark quartz, with considerable iron pyrite, some films of molybdenite, and dark grey calcite.

The property was being prospected by the Crown Reserve Mining Co. in May, 1916.




Part of Boston Creek Gold Area

### Connell-McDonough.

This property is the south half of lot 12, concession six, Catharine township. The vein on the Miller-Independence which is being prospected can be traced easterly to the Connell-McDonough claim, where there has been considerable trenching along the strike of the vein. Native gold can be observed at several places along the foot wall of the vein.

### Cullen-Renaud.

This group of claims is situated in the northeast corner of Pacaud township. Native gold has been reported to occur in several veins which outcrop on the surface. The veins which outcrop on the McRae and Miller-Independence properties, if continued to depth on their indicated dips, would pass into this property at some depth.

### Authier-Charlebois.

Mining claims L 4737 and L 5025 are situated in the southeast part of Boston township, just to the north of the McRae property. The quartz veins in the greenstone are similar to the McRae vein, being narrow and dipping about 45 deg. N. Native gold has been discovered in some of them, along with pyrite and a grey mineral bismuthinite.

Toward the north part of the property is a small area of fine grained mica granite which intrudes the greenstone. At one place near the contact there is a quartz vein one foot wide in the granite, on which a shallow pit has been sunk. Molybdenite, pyrite and bismuthinite are disseminated in parts of the quartz vein, and visible gold was reported to have been seen. A sample across eleven inches, taken a few feet from the pit, gave $4.80 in gold. Northwest of this discov-

ery, beyond a ravine, the granite is intersected by numerous quartz veinlets, some of which are several inches wide. In some of the narrow joint-like cracks native gold was observed, along with a grey mineral which gave reactions for tellurium and bismuth and is probably tetradymite. There is also considerable iron pyrites in the granite along some of the veinlets.

**Charest.**

The Charest unsurveyed claim, L 5305, is situated in the southwest quarter of McElroy township. As shown on the map, the claim is on a small stock of massive, coarse grained, flesh colored hornblende and biotite granite. A quartz vein averaging about one inch in width, and 300 feet long, strikes 30 degrees north of west across the granite. Considerable fine gold, pyrite, chalcopyrite and a grey mineral which proved to be a telluride, were noticed in different parts of the vein. A few pieces of quartz from the vein gave on assay $8.80 in gold to the ton. Other veins on the property contain molybdenite and specular hematite. Some of the veins contain coarse feldspar and are pegmatitic in character, while many of the narrow veins represent the filling of joint cracks. The occurrence of gold in the pegmatitic vein is important, since it strongly points to the formation of the gold-bearing quartz veins following the pegmatitic veins and representing part of the granite intrusion.

**Conclusion and Acknowledgments.**

The geology and mineralogy of the Boston Creek area is, in a general way, similar to that of the adjoining Swastika, Kirkland Lake and Larder Lake areas. Gold is known to be widely distributed over all the areas. No bullion has, as yet, been shipped from Boston creek. The Tough-Oakes, Swastika, Lucky Cross, La Mine d'Or Huronia and Goldfields Limited properties, which are from 12 to 15 miles from Boston Creek station, have from 1912 to the end of 1915, yielded gold valued at $779,715. Most of this production was from the Tough-Oakes mine. In Boston creek the prospecting, as yet, has been largely confined to the surface, the deepest shaft being 135 ft. (May, 1916). Prospecting is aided by the excellent transportation facilities. In prospecting the area it seems a good rule to trench in the old rocks near the porphyry dikes and small granite areas.

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The third annual State-wide first-aid and mine-rescue competitions and demonstrations for the State of Washington will be held in Tacoma, Washington, on August 19. Last year's demonstration, held at Cle Elum, were largely attended, and teams from all the larger collieries in the state took part in the competitions, which were closely contested and aroused general interest among the coal miners and their friends.

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The quarterly statement of coal and metal mine fatalities in British Columbia, issued by the Chief Inspector of Mines for that Province, shows that during three months ended June 30 there were four men killed in and about the coal mines and a similar number in and about the metal mines. The totals for the first half of each year were as follows: At coal mines, 9 in 1916 and 45 in 1915 (of the latter number 19 met their deaths by the flooding of a mine and 22 as the result of a gas explosion). At metal mines, 8 in 1916 and 8 in 1915. Falls of roof and rock and coal caused the deaths of 7 at coal mines in the first half of 1916, and falls of ground those of 4 at metal mines; together 11 out of a total of 17 were killed by those wholly preventible causes.

# PERSONAL AND GENERAL

Dr. W. G. Miller and Mr. T. F. Sutherland of the Ontario Bureau of Mines visited during June the Mt. Lyell, Mt. Bischoff, Zeehan and Broken Hill mines in Australia. On July 6 they sailed from Sydney for New Caledonia. They arrived at Noumea on July 11.

Mr. H. E. T. Haultain has been at Jewel, Ont., in the Craigmont corundum district, in connection with the erection of a new corundum mill.

J. C. Gwillim, professor of mining, at Queen's University, Kingston, is at Valcartier, having joined the tunneling company.

Dr. D. B. Dowling, of the Department of Mines, Ottawa, was in Toronto on August 1 on his way to Lethbridge, Alberta. He will endeavor to find an artesian water supply in southeastern Alberta. Three wells will be drilled in an area examined by Dr. Dowling last year.

Mr. Seaver, formerly manager of the Canadian branch of the Sullivan Machinery Co., is now manager of the Canadian Rock Drill Co., with office at 42 Scott street, Toronto.

Mr. Fred A. Jordan, formerly manager of the Moose Mountain mine at Sellwood, Ont., is now located at Duluth.

Mr. W. E. Segsworth and Mr. R. E. Hore of Toronto attended the Reunion of of the Michigan College of Mines graduates and staff last week.

Mr. C. E. Hitchcock, of Copper Cliff, has returned from the Rice Lake district, Manitoba, and attended the M. C. M. Reunion at Houghton last week.

Mr. J. S. De Lury has returned to Winnipeg from The Pas district.

Mr. C. W. Knight is at Sudbury.

Mr. Charles F. O. Merriam, of Wallace, Idaho, was at Nelson, B.C., last month examining and reporting on the Granite-Poorman group of gold mines.

Mr. Clarence Cunningham, who is operating the Wonderful, Queen Bess and Slocan Sovereign silver-lead mines in the Slocan district of British Columbia, was a recent visitor to Spokane, Washington.

Mr. Blanchard M. Synder, late of Los Angeles, California, who some years ago was superintendent at the British Columbia Copper Co.'s copper smeltery at Greenwood, Boundary district, B.C., is now at Basin, Montana, with the Cornet mines.

Mr. John B. White, of Spokane, Washington, one of the directors of the Slocan Star Mines, Ltd., was at the company's mines near Sandon, Slocan, late in July.

Mr. A. W. McCune, of Salt Lake City, Utah, who owns several mining properties situated in Ainsworth and Slocan mining divisions of British Columbia, has been on a visit to both Ainsworth and Slocan camps.

Mr. R. A. Carnachan, secretary of the Hayden, Stone Co., which recently bonded the Hudson Bay mine, near Salmo, B.C., was at the Granite-Poorman mines, near Nelson, last month.

Mr. F. J. Longworth, superintendent of the British Columbia Copper Co.'s smelting works at Greenwood, B.C., was in Spokane, Washington, on July 19.

General Charles S. Warren, of Butte, Montana, a pioneer mining operator at Rossland, B.C., the Coeur d'Alene district of Idaho, and in Montana, was in Spokane visiting old friends last month.

Mr. Jerome Drumheller, left Spokane on July 10 for New Hazelton, in Omineca mining division, B.C., where are situated several mining properties on which he holds options to purchase.

Mr. J. B. Tyrrell, of Toronto, has been spending some time in British Columbia.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

The temporary check to shipment of ore from Kootenay mines that a few weeks ago interfered with progress, has now been overcome and, generally, transportation facilities having been restored, production has been resumed. The uncertainty that was felt in regard to the outcome of demands for higher wages made on behalf of men employed at the smelting works at Trail and the Consolidated Co.'s mines at Rossland, has also passed away, the negotiations having resulted in an amicable settlement of the question, the company having to some extent met the requirements of its employees. There has also been a little difficulty concerning wages in the Crowsnest coal mining district, but there was only a short cessation of work there, for arrangement has been made for representatives of both operators and the United Mine Workers of America to meet and discuss the questions at issue with a view to arrivng at some decision that will be mutually acceptable. The decrease in prices of some of the metals is having some influence in the direction of lessening activity among those who have been seeking to acquire lead or zinc properties that have been unworked of late years, but on the whole there is no serious interruption to the progress of development work and ore production in the interior mining districts.

### EAST KOOTENAY.

During twelve weeks of last quarter, up to the time, late in June, flooded streams caused damage to railways and mine surface equipment, the output of the Sullivan mine averaged 1 666 tons of ore a week, that quantity having been received at the smelting works at Trail. For three weeks following high water in rivers and creeks only 287 tons a week reached Trail from the mine. Now, however, conditions seem to again be normal, for the quantity received during the third week in July was 1,479 tons.

Another carload shipment from the Giant mine, in the northern part of the district, has reached Trail. Preparations were being made early in July to resume work on the Paradise mine, in Windermere division, after a long period of inactivity.

### WEST KOOTENAY.

**Ainsworth.**—During the week ended July 21 ore was received at Trail from six mines in this division. This was the first time this year that there had been that many on the weekly list of shippers. All were small producers, for the total from the six was only 324 tons, still it is satisfactory to find the smaller shippers again on the list. Those that had not sent out ore for several months were the Cork-Province, Retallack & Co. and Utica. The other three were the Comfort, Florence Co. and Highland. The Utica is stated to have more ore opened now for shipping than for some time past. The work of erecting a concentrating mill for the Florence Co.'s Hope mine is being put in hand.

**Slocan.**—June shipments of the Rambler-Cariboo Mines, Ltd., are reported to have been 30 tons of crude lead ore, 160 tons of lead concentrate and 60 tons of zinc concentrate. The gross profit from the lead product is stated to have been approximately $17,000, and the net earnings about $11,000. Most of the zinc outfit for May and June was still on hand in July, difficulty having been experienced in marketing it, owing to low grade and excess iron content. Arrangements are being made to re-treat zinc concentrate at the custom mill at Kaslo, and it is expected that they will thereby be rendered more marketable.

Northwest Mining Truth said recently, in reply to an inquiry concerning the Galena Farm Mining Co.: The property of this company is situated near Silverton. It is controlled by the estate of Patrick Clark, under the management of his oldest son, P. W. Clark. About one-fourth interest is held by New York friends of the late Mr. Clark. A concentrating mill of 100 tons daily capacity was completed a few months ago, and it is running successfully. Twenty years ago the property was acquired by Charles Callahan, a well-known English engineer who came from Australia, but when the price of silver declined so precipitately in 1893 work was discontinued. Until the late Mr. Clark reopened it nothing hal been done on the property for many years. Some high grade zinc orebodies of magnitude, containing good values in silver, have been exposed and there is said to be enough ore in sight to keep the plant running at capacity for several years.

The Lucky Thought mine, on Four-mile creek, near Silverton, which is under option of purchase to the Consolidated Mining and Smelting Co., is looking sufficiently well for it to be thought probable that company will eventually complete purchase. Owing to the wagon road to Silverton having been damaged by floods in June, it was not practicable to ship ore in July, but repairs having been effected hauling will be done in July, with something like 200 tons awaiting shipment. Ore recipts at the smelting works at Trail from this mine during the first half of the year totaled 260 tons.

The Ottawa, in Slocan City division, owned by the Consolidated M. and S. Co., recently sent to Trail 43 tons of silver ore, this being the first lot shipped this year. Some years ago this mine was one of the important producers of Slocan City division. The Black Prince, in the same division, recently shipped to Trail a car of high grade silver ore, which was its first shipment since last January.

**Nelson.**—The Granite-Poorman group of gold mines, situated within half a dozen miles of Nelson, has been bonded by Messrs. W. E. Cullen and R. A. Carnochan, of Spokane, Washington; John Maginnis and H. I. Wilson, of Butte, and T. B. Miller, of Helena, Montana. These mines have been intermittent producers over a comparatively long period, probably for twenty years. Some years ago they were operated by the Duncan United Mines Co.; then they were for some time worked by Thos. Gough and associates, who eventually sold them to a company organized locally as the Kootenay Gold Mines, but which finally got into financial difficulties, and the property has since been looked after by a receiver, until it was leased to several local men, who are understood to have operated profitably for the last year or more. Now these lessees have passed their option of purchase on to the syndicate first-above mentioned. The group embraces 13 mineral claims, having a total area of about 350 acres, a mill site of 15 acres and a 20 stamp mill. The Nelson Daily News recently published the information that the average value of all ore (unsorted) milled during the period 1899-1912 was $6.12 a ton. Latterly the ore has

been sorted before being milled, and the grade raised to an average of between $12 and $13 a ton. The last mill run, of 100 tons, gave an average of $12.10 a ton.

Mr. J. L. Bruce, of Butte, Montana, general manager of the Butte & Superior and Hudson Bay Zinc Companies, when in Spokane on July 12, on his way home from the Hudson Bay mine, near Salmo, B.C., said: "While we have been shipping zinc ore from the Hudson Bay mine at the rate of about 45 tons daily, and may increase our output somewhat now that the roads are in good condition, we are concentrating our energies principally on getting the crosscut tunnel to the ledge. It has already been driven 900 ft., with approximately 800 ft. yet to go to reach the vein, which it will cut at a depth of 850 ft. below the outcrop, or more than 500 ft. below our present level. We shall try working three shifts of men, and if it does not prove too expensive we shall keep them on until the vein shall be reached, for we are anxious to complete the driving of this tunnel within three months." The Hudson Bay mine, which latterly has shipped little if any other than an oxidized zinc ore, is situated on Deer Creek, a tributary of Sheep creek, in the southern part of Nelson mining division. In 1914 there was shipped to Trail from this mine 2,094 tons of lead ore and in 1915 429 tons. This year only 116 tons of ore reached Trail from this mine. Its zinc-ore output last year was estimated at approximately 4,000 tons, stated to have averaged about 30 per cent. zinc, shipped to the United States. Much zinc ore has also been shipped this year.

**Rossland.**—The Premier of British Columbia (Hon. W. J. Bowser) and others of his party who have been making a tour of the Okanagan, Boundary and West Kootenay districts, on July 23 visited the Consolidated Mining and Smelting Co.'s Centre Star, War Eagle and Le Roi mines, in Rossland camp. They were lowered in a cage down the Centre Star incline shaft to a depth of 2,300 ft. The Nelson Daily News correspondent, in his account of the visit, stated that "750 men are employed in these three mines. Members of the visiting party declared that the mines with their modern equipment of electric train and lighting and the miles of tunnels made one of the most impressive evidences of the natural resources of the country they had seen throughout their tour."

The Josie mine report for the month of May has been made public by the London office of the Le Roi No. 2, Ltd., as follows: "Shipped to Trail, 1,515 tons of ore. The receipts from the smeltery were $22,201, being payment for 1,967 tons of ore shipped; umpires, etc., $1,443; sundries, $431; total receipts, $24,075. Estimated working costs for the corresponding period were: Ore production, $7,800; capital expenditure, $636; development (including diamond drilling), $3,600; total, $12,036." Adding figures published earlier, it is seen that the total receipts for five months of 1916 to the end of May have been $92,297, and expenditures $76,790, leaving a credit balance of $15,507.

## GENERAL NOTES.

On July 5 the "Spokesman-Review," of Spokane, Washington, published the following: "The clean-up at the Union Hydraulic mine, near Vernon, B.C., was a great disappointment,' said Russell H. Hanauer on his return yesterday from a visit to that property.' Though we moved six times the volume of gravel that was handled last season, the yield of gold was only $4,500, or not quite twice what was gained last season. We lost about $4,000 on the season's operations."

Last month the Railway Commissioners heard arguments in favor of the contention of those interested in the Lardeau district of West Kooteney that the Canadian Pacific Railway Co. should be required to maintain a regular train service on its branch line from the head of Kootenay lake to Gerrard at the foot of Trout lake, and a steamer service on Trout lake between Gerrard and Trout Lake City, as it had done for many years until recently. One of the advocates in the interest of mining in Trout Lake mining division said that without assurance of a railway service it would be impossible to obtain capital for the development of the many mining properties in the Lardeau district. He mentioned the Triune, Great Northern, Silver Cup, Lucky Boy as mines that would ship ore if suitable transportation facilities were provided. The Triune, he stated, has from 1,200 to 1,500 tons of ore available for shipment, which ore could be marketed while the prices of metals were high, as at the present. He did not contend that there was sufficient business in sight to make the operation of the branch railway and steamer service profitable, but such service should be discontinued the Lardeau country could not be developed. Another speaker pointed out that if the railway service were not continued the operation of the Marblehead quarry, situated about ten miles along the line from Lardo, on Kootenay lake, would not be practicable. About $300,000 had been spent in the acquirement and development of this property, which would have an output of a car and a half of marble a day when conditions should again become such that orders would be received. There was now about 50,000 tons of marble on the bank ready for shipment. If operated at full capacity, the quarry would give employment to 100 men. The C.P.R. official representing the company at the hearing showed that no marble was shipped in 1914, and only six or eight cars in 1915, but the manager of the quarry replied that only development work had attention in the former year. The C. P. R. representative submitted figures for three years, as follows: Total cost of railway and train services, $100,387; total recipts, $47,407; loss to the company, $52,980. The Board reserved its decision.

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Mr. Jules Labarthe, of San Francisco, California, engineer in charge of construction of the Bunker Hill & Sullivan Co.'s smeltery at Kellogg, Coeur d'Alene district of Idaho, when in Spokane, Washington, last month after a visit to the Consolidated M. & So. Co.'s smelting works at Trail, of which he was superintendent for several years prior to his removal to the United States three or four years ago, stated that he found the reduction works at Trail a great deal larger than when he was in charge, and still being enlarged. "They are making a success of their electrolytic zinc refining operations and are enlarging the capacity of the works by making a big addition. It is the first plant of the kind I have ever seen in operation, except an experimental plant of similar character at Anaconda, Montana," he said.

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Metalliferous mining companies operating in British Columbia that have declared dividends payable in August are: Granby Consolidated M. S. and P. Co. $2 a share, total $299,970, August 1; Standard Silver-Lead Mining Co., 2½c. a share, total $50,000, August 10; Rambler-Cariboo Mines, 1c. a share, total $17,500, August 15.

## La ROSE.

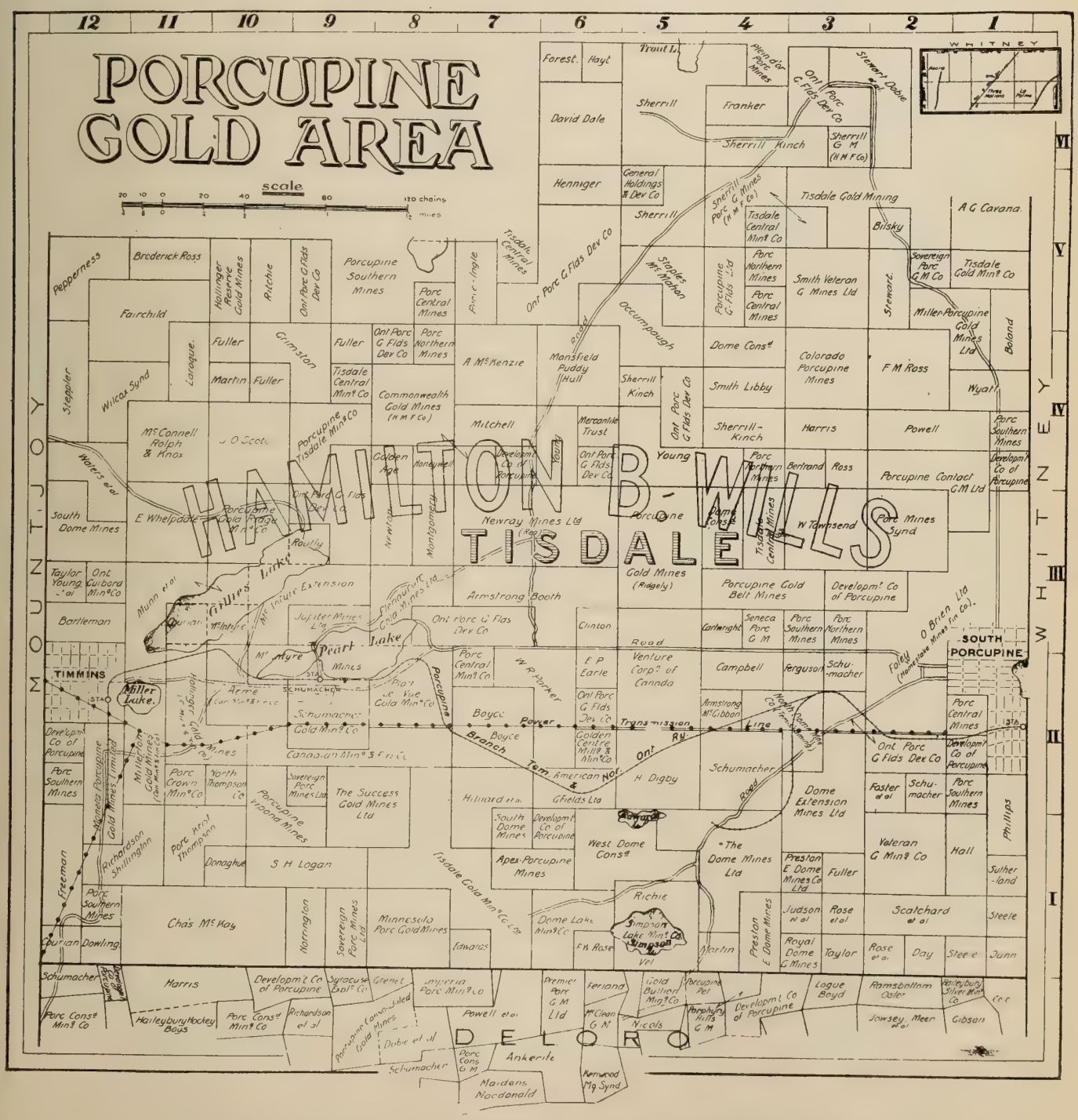
The shaft on the Maidens-McDonald property in the Porcupine district is now down approximately 100 feet, the work being done under La Rose management. The shaft will be continued to a depth of 110 ft. and a crosscut run to cut the vein at that level. One drill is now working on the Lawson property of the La Rose Consolidated, and in the original La Rose mine the most of the work is being done in the old stopes and workings.—Cobalt Nugget.

## CROESUS.

The Croesus mines in Munro township will start as soon as possible on the erection of a new plant and buildings. It has not been decided yet whether or not a larger plant will be installed.—Northern Miner.

## SILVER PRICES.

| | | New York, cents. | London, pence. |
|---|---|---|---|
| July | 21 | 63⅜ | 30 3/16 |
| " | 22 | 63¾ | 30 5/16 |
| " | 24 | 63¼ | 30⅛ |
| " | 27 | 63¾ | 30⅜ |
| " | 29 | 63½ | 30¼ |
| " | 31 | 64⅛ | 30 9/16 |
| Aug. | 1 | 64 | 30½ |
| " | 2 | 64 | 30½ |
| " | 3 | 64¾ | 30⅞ |
| " | 4 | 64⅞ | 30 13/16 |
| " | 7 | 65⅞ | 31 7/16 |
| " | 8 | 66¼ | 31⅝ |
| " | 9 | 66⅞ | 31 13/16 |
| " | 10 | 66¼ | 31⅝ |


PORCUPINE GOLD AREA
HAMILTON B. WILLS
TISDALE
DELORO
TIMMINS
SOUTH PORCUPINE
scale
WHITNEY
Forest.
Hoyt
Trout L.
Sherrill
Franker
David Dale
Sherrill Kinch
Henniger
General Holdings & Dev Co
Tisdale Gold Mining
Bilsky
A G Carana
Pepperness
Broderick Ross
Fairchild
Porcupine Southern Mines
Porc Central Mines
Porc Northern Mines
Smith Veteran G Mines Ltd
Tisdale Gold Mining Co
Miller-Porcupine Gold Mines Ltd
Boland
Wyatt
Colorado Porcupine Mines
F M Ross
Dome Consd
Smith Libby
Harris
Powell
Porc Southern Mines
Porcupine Contact G M Ltd
Development Co of Porcupine
Mansfield Puddy (Hull)
Occumpaugh
Staples Mc Mahon
Mercantile Trust
Commonwealth Gold Mines (M M F Co)
A Mc Kenzie
Mitchell
Newray Mines Ltd
Porcupine Cold Belt Mines
Development Co of Porcupine
Armstrong Booth
Ont Porc G Flds Dev Co
Pearl Lake
Venture Corp of Canada
Campbell
Ferguson
Schumacher
Seneca Porc G M
Cartwright
Clinton
Road
E P Earle
Boyce
Porcupine Branch
Temiskaming & Northern Ont Ry
Transmission Line
Armstrong McGibbon
Golden Centre Mines & Mill Co
H Digby
Schumacher
Dome Extension Mines Ltd
Foster et al
Veteran G Mining Co
Hall
Phillips
Sutherland
Steele
Scatchard et al
Rose et al
Day
Dunn
Taylor
Royal Dome G Mines
Judson et al
Preston E Dome Mines Co Ltd
Fuller
The Dome Mines Ltd
West Dome Consd
Apex-Porcupine Mines
Hillyard et al
South Dome Mines
Gfields Ltd
The Success Gold Mines Ltd
Sovereign Porc Mines Ltd
Porcupine Imperial Mines
Porc Crown Mining Co
North Thompson Co
Porc Krist Thompson
Donaghue
S H Logan
Richie
Simpson Lake Mining Co
Simpson Vel
Dome Lake Mining Co
F W Rose
Martin
Preston E Dome Mines
Chas Mc Kay
Minnesota Porc Gold Mines
Edwards
Isabella Gold Mining Co Ltd
Porcupine Crown Mines Limited
Millerett Gold Mines (Can Mines) Limited
Richardson Shillington
Freeman
Dowling
Durian
Schumacher
Harris
Development Co of Porcupine
Syracuse Bald Co
Grenet
Imperial Porc Mining Co
Premier Porc G M Ltd
Ferland
Gold Bullion Mining Co
Porcupine Per
Porphyry Hills G M
Development Co of Porcupine
Logue Boyd
Ramsbottom Osler
Haileybury Silver Mining Co
Haileybury Hockey Boys
Porc Consd Mining Co
Richardson et al
Porcupine Consolidated Gold Mines
Dubie et al
Porc Cons G M
Ankerite
Schumacher
Maidens Macdonald
Kenwood Mg Syndicate
Jowsey Meen et al
Gibson
Tisdale Central Mines
Ont Porc G Flds Dev Co
Sherrill Porc G Mines (H M F Co)
Sherrill G M (H M F Co)
Porcupine Tisdale Mining Co
Tisdale Central Mining Co
Porcupine Gold Mines (Can Mines) Limited
Miller Lake
Schumacher Gold Mining Co
Canadian Mining & Finance Co
Porcupine Boundary Mines
Porcupine Tisdale Gold Mines
Porcupine Southern Mines
Porc Central Mining Co
Porc Northern Mines
Ont Porc G Flds Dev Co
Tisdale Central Mining Co
Commonwealth Gold Mines (M M F Co)
Porcupine Tisdale Mining Co
Porcupine Gold Mines
Porcupine Boundary Mines
Porcupine Crown Mining Co
Sovereign Porc Mines Ltd
Porcupine Imperial Mines
Porcupine Consolidated Gold Mines
Porcupine Tisdale Gold Mines
Porcupine Gold Mines (Can Mines) Limited
Millerett Gold Mines (Can Mines) Limited
Porcupine Crown Mining Co

# MARKETS

## NEW YORK MARKETS.

August 10, 1916—Connellsville Coke—
- Furnace, spot, $2.75 to $2.85.
- Furnace, contract, $2.50.
- Foundry, prompt, $3.25 to $3.50.
- Foundry, contract, $3.25 to $3.50.

August 10 1916—Straits Tin, 38.30 cents.
- Copper—
  - Prime Lake, nominal, 26.00 to 26.50 cents.
  - Electrolytic, nominal, 26.75 to 27.00 cents.
  - Casting, nominal, 24.00 to 24.25 cents.
- Lead, Trust price, 6.00 cents.
- Lead, outside, 5.97½ cents.
- Spelter, prompt western shipments, 8.37½ to 8.47½ cents.
- Antimony—
  - Chinese and Japanese, nominal, 10.50 cents.
  - American, nominal, 10.50 cents.
- Aluminum—nominal—
  - No. 1 Virgin, 98-99 per cent., 58.00 to 60.00 cents.
  - Pure 98-00 per cent. remelt, 56.00 to 58.00 cents.
  - No. 12 alloy remelt, 45.00 to 47.00 cents.
  - Powdered aluminum, $1.00 to $1.15.
- Metallic magnesium, 99 per cent. plus, $3.50 to $3.75.
- Nickel, 45.00 to 50.00 cents.
- Cadmium, nominal, $1.25 to $1.50.
- Quicksilver, nominal, $75.00.
- Platinum, nominal, $60.00.
- Cobalt (metallic), $1.25.
- Silver (official), 66¼ cents.

Metal Products.—Following base prices are all f.o.b. mill, but prices are purely nominal.
- Sheet copper, hot rolled, 35.50 cents.
- Sheet copper, cold rolled, 36.50 cents.
- Copper wire, nominal, 31.00 cents.
- Copper wire, nominal, October, 29.75.
- High sheet brass, 38.00 to 39.00 cents.
- Seamless brass tubing, 44.00 to 45.00 cents.
- Seamless copper tubing, 44.50 to 45.50 cents.
- Brazed brass tubing, 45.50 to 46.50 cents.
- Brass wire, 38.00 to 39.00 cents.
- Brass rods, 38.00 to 39.00 cents.
- Sheet zinc, f.o.b. smelter, 15.00 cents.

## TORONTO MARKETS.

Aug. 14—(Quotations from Canada Metal Co., Toronto)—
- Spelter, 12 cents per lb.
- Lead, 8 cents per lb.
- Tin, 44 cents per lb.
- Antimony, 16 cents per lb.
- Copper, casting, 27 cents per lb.
- Electrolytic, 28¼ cents per lb.
- Ingot brass, yellow, 15 cents; red, 18 cents per lb.

Aug. 14—(Quotations from Elias Rogers Co., Toronto)—
- Coal, anthracite, $8 per ton.
- Coal, bituminous, $5.50 per ton.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto.)

As of close August 8th, 1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Atla. Cons. | 20.00 | 28.00 |
| Butte. | 43.00 | 43.65 |
| Can. Car | 40.00 | 50.00 |
| Curtiss Aeroplane | 25.00 | 40.00 |
| Can. Copper | 1.38 | 1.50 |
| Cambria Steel | 81.00 | 85.00 |
| Canada Cement | 57.00 | 57.37½ |
| Emma Copper | 50.00 | 54.00 |
| Howe Sound | 4.50 | 4.75 |
| International Petroleum | 9.40 | 10.00 |
| International Nickel (new) | 44.25 | 44.75 |
| Kennecott Copper | 46.50 | 48.00 |
| Maxim Munitions | 4.50 | 4.75 |
| Midvale Steel | 61.00 | 61.25 |
| Marconi. | 3.38 | 3.50 |
| Magma. | 13.50 | 14.50 |
| Mother Lode | 30.00 | 31.00 |
| Steel of Canada | 52.00 | 55.00 |
| Submarine Boat | 32.75 | 33.50 |
| Tonopah Extension | 5.75 | 6.00 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex. | .07⅛ | .07¼ |
| Dome Consolidated | .10 | .15 |
| Dome Extension | .34½ | .35 |
| Dome Lake | .42½ | .43 |
| Dome Mines | 25.50 | ... |
| Eldorado. | ... | .00⅜ |
| Foley O'Brien | .50 | ... |
| Gold Reef | .01 | .02 |
| Hollinger. | 28.25 | 29.00 |
| Homestakes. | .60 | .70 |
| Jupiter. | .25½ | .30 |
| McIntyre. | 1.38 | 1.39 |
| Moneta. | .14½ | .15½ |
| Porcupine Crown | .63 | .70 |
| Porcupine Imperial | .03 | .03⅛ |
| Porcupine Tisdale | .01½ | .02 |
| Porcupine Vipond | .41 | .41½ |
| Preston East Dome. | .04½ | .04¾ |
| New Ray | .46 | .48 |
| Teck Hughes | .25½ | .26 |
| West Dome | .39½ | .40 |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac. | .22 | ... |
| Bailey. | .07½ | .08 |
| Beaver. | .37 | .38 |
| Buffalo. | .75 | 1.10 |
| Chambers Ferland | .17 | .20 |
| Coniagas. | 4.30 | ... |
| Crown Reserve | .40 | .42 |
| Foster. | ... | .08 |
| Gifford. | .04½ | .05 |
| Gould. | .00¼ | .00½ |
| Great Northern | .04 | .05 |
| Hargreaves. | .03¼ | .03¾ |
| Hudson Bay | 55.00 | ... |
| Kerr Lake | 4.35 | 4.62½ |
| La Rose | .62 | ... |
| McKinley. | .59½ | ... |
| Nipissing. | 6.85 | 7.10 |
| Ophir. | .08 | .08¾ |
| Peterson Lake | .23¼ | .23½ |
| Right of Way | .04⅞ | .05 |
| Seneca Superior | .21 | .25 |
| Silver Leaf | .01⅞ | .02 |
| Temiskaming. | .58½ | .59 |
| Trethewey. | .21 | .21½ |
| York Ontario | .01½ | .02 |
| Wettlaufer. | .15 | .16 |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Northern Canada Supply Co.
Jones & Glassco

**Blasting Batteries and Supplies—**
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada) Ltd.
Northern Canada Supply Co.
Canadian Explosives, Limited

**Blowers—**
Fraser & Chalmers of Canada, Limited.
Northern Canada Supply Co.

**Boilers—**
Fraser & Chalmers of Canada, Limited.
Northern Canada Supply Co.
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**Boxes, Cable Junction—**
Standard Underground Cable Co. of Can., Ltd.

**Buckets—**
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**Cable — Aerial and Underground—**
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**Cableways—**
Fraser & Chalmers of Canada, Limited.
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**Drill Steel—Mining—**
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Sullivan Maclinery Co.

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Smart-Turner Machine Co.

**Engines—Gas and Gasoline**
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Sullivan Machinery Co.
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**Engines—Haulage—**
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**Engines—Marine—**
Smart-Turner Machine Co.

**Engines—Steam—**
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**Fans—Ventilating—**
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**Feeders—Ore—**
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Fraser & Chalmers of Canada, Limited

## Canadian Miner's Buying Directory.—(Continued from page 14.)

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Jeffrey Mfg. Co.
Northern Canada Supply Co.

**Pumps—Boiler Feed—**
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**Pumps—Pneumatic—**
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Smart-Turner Machine Co.
Can. Ingersoll-Rand Co., Ltd
Sullivan Machinery Co.

**Pumps—Steam—**
Can. Ingersoll-Rand Co., Ltd
Darling Bros., Ltd.
Mussens, Limited.
Northern Canada Supply Co.
Smart-Turner Machine Co.

**Pumps—Turbine—**
Darling Bros., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
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**Pumps—Vacuum—**
Darling Bros., Ltd.
Smart-Turner Machine Co.

**Quarrying Machinery—**
Sullivan Machinery Co.
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**Rails—**
W. Fraser.

**Roasting Plants—**
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**Rolls—Crushing—**
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**Roofing—**
Northern Canada Supply Co.

**Rope—Manilla and Jute—**
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Northern Canada Supply Co.
Allan, Whyte & Co.

**Rope—Wire—**
B. Greening Wire Co., Ltd.
Allan, Whyte & Co.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Limited

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**Screens—**
B. Greening Wire Co., Ltd.
Jeffrey Mfg. Co.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Limited
Roberts & Schaefer Co.

**Screens—Cross Patent Flanged Lip—**
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**Separators—**
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Smart-Turner Machine Co.

**Sheets—Genuine Manganese Bronze—**
Hendrick Mfg. Co.

**Shovels—Steam—**
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**Smelting Machinery—**
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**Stacks—Smoke Stacks—**
Hendrick Mfg. Co.

**Stamp Mills—**
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**Steel Barrels—**
Smart-Turner Machine Co.

**Steel Drills—**
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Northern Canada Supply Co.
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**Steel Drums—**
Smart-Turner Machine Co.

**Steel—Tool—**
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## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 10
Armstrong, Whitworth of Can., Ltd. 2

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
M. Beatty & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
Berger, C. L. & Son . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd. . . . . 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co. . . . . 6
Canadian Explosives, Ltd. . . . . 5
Can. Ingersoll-Rand Co., Ltd.... 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. . . . . 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . .Outside Back Cover

D

Dept. of Finance..Outside back cover
Dept. of Mines, Canada. . . . . .Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd. . . . . 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fraser & Chalmers of Can., Ltd.. 4
Fuller, A. S. & Co. . . . . 12

G.

Gartshore, J. J. . . . . 12
B. Greening Wire Co., Ltd. . . . . .Front cover

H

Hassan, A. A. . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11

I

Imperial Bank of Canada . . . . . 6
International Nickel Co. . . . . 6

J

Johnson, Matthey & Co. . . . . 11
Jones & Glassco . . . . . 10

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

MacKinnon, Holmes & Co. . . . . 16
Murphy, Chas. J. . . . . 11
Mussens, Ltd. . . . . 10

N

New Ontario Oil & Gas Co. . . . . 9
Nova Scotia Steel & Coal Co.... 4
Nova Scotia, Province of. . . . . 8
Northern Canada Supply Co., Ltd. 7

O

Orillia Molybdenum Co. . . . . 16
Ontario, Province of . . . . . .Inside Back Cover

P

Pacific Coast Pipe Co., Ltd. .... 9

Q

Quebec, Province of . . . . . 8

R.

Roberts & Schaefer Co. . . . . 3

S

School of Mining . . . . . 16
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 12
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2
Summerhayes, Maurice W. . . . . 11

T

Tyrrell, J. B. . . . . 11

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TORONTO

No. 17

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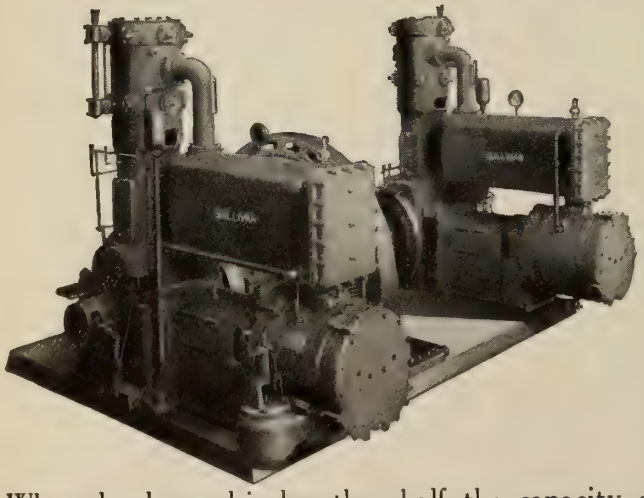
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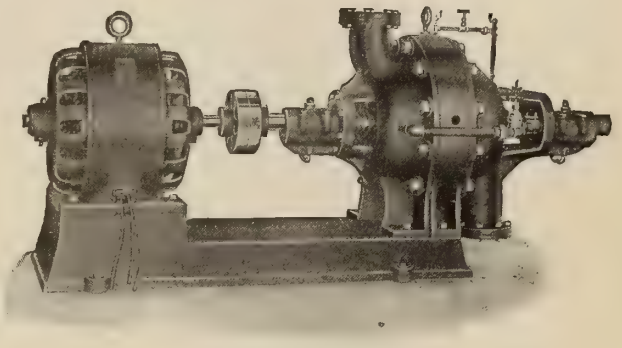
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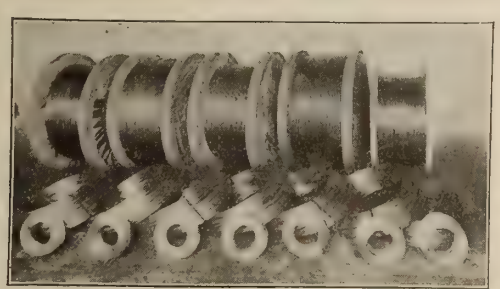
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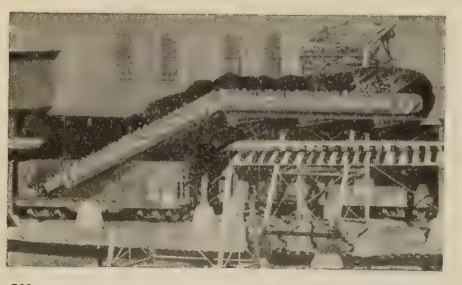
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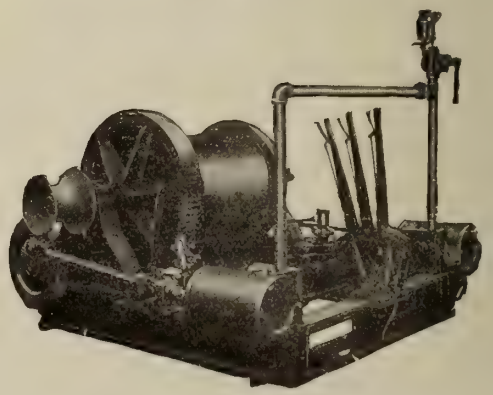
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# THE CANADIAN MINING JOURNAL

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CONTENTS

| Editorials— | Page. |
|---|---|
| U. S. Exports of Nickel | 407 |
| German Imports and Exports of Nickel | 408 |
| The "Telegram" on Nickel | 408 |
| Mineral Resources of Manitoba | 409 |
| Mr. Ferguson on Nickel Export | 410 |
| Mr. Dewart on Nickel | 411 |
| The Mineral Belt North of The Pas, Manitoba. By Justin S. De Lury | 412 |
| A New Flotation Oil—By Maxwell Adams | 416 |
| A Few Notes on Callon Flotation. By A. G. Morrison. | 417 |
| Book Review, Economic Geology. By H. Ries | 420 |
| Pyrite Mining in Ontario. By P. E. Hopkins | 422 |
| Canadian Mining Institute, Western Branch | 423 |
| Personal and General | 426 |
| Special Correspondence | 427 |
| Markets | 428 |

## U. S. EXPORTS OF NICKEL

During the past few weeks there has been published in Canadian papers considerable discussion on the export of Canadian nickel from the United States to Germany. For the most part the discussion is based on rumors rather than on facts; but none of those who should know the facts has made a plain statement of the source of the nickel shipped on the "Deutschland," nor satisfactorily denied that several million pounds of nickel have reached Germany since the war began. The officers of the Government have been content to repeat the assertion that not a pound of Canadian nickel has been shipped to Germany since the war began. We hope they are right; but we doubt whether the public believes it. For ourselves we believe the statement to mean that no considerable quantity of Canadian nickel refined since the war began has been shipped to Germany. As for Canadian nickel refined before the war began we must wait for the British Admiralty's report on what happened to cargoes of nickel shipped to neutral countries bordering on Germany.

In a political speech in Toronto two weeks ago, Mr. Hartley Dewart presented figures on exportation of nickel from the United States which he professed to indicate that the Canadian Government's statements concerning exports were not to be relied upon. Political speches made a few days before election day are of course to be taken at a discount; but in view of the publicity given to Mr. Dewart's comments on the nickel industry it is not unlikely that his figures may be taken by many to prove the truth of what are still unproven rumors.

In this issue we publish a portion of Mr. Dewart's speech as reported by the "World." On another page we publish the report of the U. S. Department of Trade and Navigation on export of nickel during 1915 and during the fiscal years ending June 30, 1913, 1914 and 1915.

From the latter report it will be seen that the amount of nickel exported from the United States to Germany during the year ending June 30, 1915, was 1,036,242 lb., and to Austria-Hungary 67,200 lb. This would be only a normal amount for the five weeks before August 4, 1914. The figures indicate therefore that export must have been discontinued immediately war was declared. This agrees with the statements issued by our Government and not with the contentions of the alarmists.

The U. S. official reports show that there were great increases in exports of nickel during the first year of war to Russia, Italy and Japan, as well as to England

and Scotland, while the amounts going to other countries were, with the exception of Sweden, small. Sweden took 367,696 lb., which seems a large amount for that country. Norway imported 31,158 lb. and Denmark 43,830 lb. Obviously these countries have been able to get no nickel in Germany since the war began and they would have to import from the United States or England for their own needs.

So far as we know the consumption of nickel in these countries before the war was very small. What did Sweden do with that 367,696 lb.? Did Germany get any of it? Did it go to Russia? Such questions are natural and should be answered. They have been answered by the official statement that the British Admiralty is satisfied. That answer we have accepted in the belief that the Admiralty can show, if it wishes to do so, that the nickel has not reached Germany. The answer has not, however, been of such a character as to be considered entirely satisfactory. Sweden is a great steel-making country and may be using nickel in the manufacture of nickel steel. Available records of Sweden's imports in several years previous to the war, however, do not show imports of nickel, and we have no figures for comparison.

---

We accept the statement of the Admiralty that the arrangements made are satisfactory and we assume that the statement must apply to the nickel shipped from the United States to Sweden. The Admiralty has, however, very much to do and if it should intimate that there is anything questionable about the destination of the nickel imported by Sweden we should not hesitate to take any necessary measures to prevent more such exports. Canadians will not knowingly permit Ontario nickel to reach the enemy. We should be informed more particularly why the arrangements are regarded as satisfactory.

---

The U. S. exports of nickel to Norway, Denmark and Holland during the first year of the war totalled 97,021 lb. This is surely not an amount to warrant the talk of millions of pounds of nickel reaching Germany. The amount going to Holland during the year ending June 1915, like that going to Germany and Austria-Hungary would be only the normal amount for the five weeks ending August 4, 1914.

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Mr. Dewart claims that official records show that millions of pounds of nickel have been shipped during the war to countries which have passed it on to Germany. There is nothing in the records to indicate any such traffic. The only questionable item in the exports for the year ending June 30, 1915, is the 367,696 lb. shipped to Sweden. That may have been used in Sweden.

The following tables show U. S. imports and exports of nickel in the fiscal years ending June 30:—

**U. S. IMPORTS OF NICKEL, 1913-14-15.**
**(Fiscal Years Ending June 30.)**

| | 1913. | 1914. | 1915. |
|---|---|---|---|
| Belgium— | | | |
| Ore or matte, tons | 1,371 | 1,243 | 242 |
| Metal contents, lb. | 2,498,262 | 2,037,008 | 317,971 |
| Canada— | | | |
| Ore or matte, tons | 35,597 | 35,174 | 29,592 |
| Metal contents, lb. | 45,010,108 | 41,507,255 | 36,607,235 |
| Oceania— | | | |
| British, Australia. | | | |
| Ore or matte, tons | ..... | ..... | 601 |
| Metal contents, lb. | ..... | ..... | 539,109 |
| Norway— | | | |
| Ore or matte, tons | ..... | ..... | 366 |
| Metal contents, lb. | ..... | ..... | 530,704 |
| Total— | | | |
| Tons | 36,968 | 36,420 | 30,801 |
| Lbs. | 47,508,370 | 43,549,303 | 37,995,019 |

**U. S. EXPORTS OF NICKEL, 1913-14-15.**
**(Fiscal Years Ending June 30th.**

| | 1913. | 1914. | 1915. |
|---|---|---|---|
| Austria-Hungary, lb. | 134,400 | 672,043 | 67,200 |
| Belgium, lb. | 1,719,285 | 1,230,274 | 210,612 |
| France, lb. | 4,197,110 | 4,419,663 | 3,210,980 |
| Germany lb. | 2,346,325 | 11,084,366 | 1,036,242 |
| Italy, lb. | 1,075,303 | 1,276,905 | 2,365,177 |
| Netherlands lb. | 9,164,012 | 2,376,216 | 22,033 |
| Russia in Europe, lb. | 7,250 | 186,626 | 4,082,280 |
| Sweden, lb. | ..... | ..... | 367,696 |
| Spain, lb. | ..... | ..... | 700 |
| Norway, lb | ..... | ..... | 31,158 |
| Denmark, lb. | ..... | ..... | 43,830 |
| United Kingdom— | | | |
| England, lb. | 2,334,845 | 2,171,511 | 8,535,418 |
| Scotland, lb. | 6,878,264 | 5,433,081 | 7,817,384 |
| North America— | | | |
| Canada, lb. | 16,379 | 42,529 | 52,949 |
| Mexico, lb. | ..... | ..... | 1,779 |
| West Indies (Br.), lb. | ..... | ..... | 300 |
| South America— | | | |
| Brazil, lb. | 1,796 | ..... | ..... |
| Columbia, lb, | 32 | ..... | ..... |
| Asia— | | | |
| Japan, lb | 5,447 | 2,028 | 308,444 |
| Russia, lb. | ..... | ..... | 1,423,030 |
| Oceania— | | | |
| British Australia and Tasmania, lb. | 829 | ..... | 22,400 |
| Total | 27,881,277 | 28,895,242 | 29,599,612 |

The amount of nickel imported and exported by the United States in the calendar year 1915 was, according to the U. S. Reports on Trade and Navigation as follows:—

**U. S. IMPORTS AND EXPORTS OF NICKEL, 1915.**
**(Calendar Year.)**

| | Quantity. | Value. | Per lb. |
|---|---|---|---|
| Imports: Ore and matte— | | | |
| Gross tons | 45,798 | ..... | ..... |
| Nickel, lb. | 56,352,582 | $7,615,999 | $13.51 |
| Exports: Nickel— | | | |
| To France | 3,018,354 | 1,124,382 | 37.25 |
| To Netherlands, lb. | 129,557 | 55,954 | 43.18 |
| To United Kingdom, lb. | 14,801,565 | 5,317,532 | 35.92 |
| To other countries | 8,469,074 | 3,540,646 | 41.81 |
| Total | 26,418,550 | $10,038,514 | $37,997 |

## THE "TELEGRAM" ON NICKEL

The Toronto "Telegram" in its issue of Aug. 23, under the caption "Ontario's Nickel Insanity," says: "A few boarding houses around two or three holes in the ground, plus Sudbury, represent all that Ontario has to show for a monopoly of 90 per cent. of the world's nickel supply."

The "Telegram" thus exposes its knowledge of the nickel industry. Many other Canadian papers seem to be no better informed on a subject which they venture to comment on at frequent intervals.

Surely the editors of our daily newspapers owe something to their readers. If they want to publish columns about the nickel industry, they should make some effort to learn the facts.

The Sudbury nickel industry is one of Ontario's greatest and most profitable industries. Unfortunately much of the profit goes out of the country to the men who control the industry. Unfortunately some of the work that might be done in Canada is being done in New Jersey. The fact remains, however, that several thousand men are profitably employed in the industry in Ontario; that the wages paid this year will amount to about $5,000,000; that many of the employees share in the profits; and that the companies spend millions in Ontario for plant, supplies, freight, etc. It is nonsense to contend that such an industry is of no advantage to Ontario. On the contrary, it is because such industries are desirable that we want to see the refining of the nickel-copper matte, as well as the mining and smelting of the ores, done in Canada.

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Commenting on the class of labor used in the nickel industry, "Saturday Night" says: "We utilize brawn and not brains on our end of the production, and the consequence is that the wage bill in Canada is all out of proportion to the number of men engaged, as compared with the high class of labor used in the refining process." From this one might judge that "Saturday Night" must have made as little attempt to learn the truth about the nickel industry as has the Toronto "Telegram." It even accepted without criticism Mr. Dewart's clever manipulation of the official reports of the foreign trade of the United States.

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## GERMAN IMPORTS AND EXPORTS OF NICKEL

A feature of the comments being made on the large amount of nickel imported by Germany before the war is the lack of appreciation of the fact that Germany exported considerable nickel during that time. According to the statistics collected by "Mineral Industry," of New York, German imports and exports of nickel from 1901 to 1913, in metric tons, were as follows (1 metric ton = 1.1023 tons):

| Year. | Imports. | Exports. | Difference. |
|---|---|---|---|
| 1901 | 1,947 | 390 | 1,557 |
| 1902 | 1,458 | 689 | 769 |
| 1903 | 1,507 | 700 | 807 |
| 1904 | 1,702 | 1,203 | 499 |
| 1905 | 1,955 | 1,034 | 921 |
| 1906 | 3,478 | 954 | 2,524 |
| 1907 | 2,182 | 930 | 1,252 |
| 1908 | 3,058 | 1,349 | 1,709 |
| 1909 | 3,745 | 1,606 | 1,139 |
| 1910 | 4,606 | 1,381 | 2,225 |
| 1911 | 2,598 | 1,592 | 1,006 |
| 1912 | 2,027 | 1,677 | 450 |
| 1913 | 3,315 | 1,673 | 1,642 |

What significance should be attached to these figures is a question. We have learned to place little reliance on German official statements. We reprint them here from "Mineral Industry" to call attention to the fact that, according to the Germans, a large part of the nickel imported was exported again.

If we assume the German figures to be correct, it will appear at once that, as compared with the United States, Germany has consumed but a small portion of the nickel production of Ontario. The matte produced in Ontario in the years 1901 to 1913 contained 158,642 tons nickel. Germany's total imports during that time, including nickel from other countries than Canada, were about 37,000 tons, of which a very considerable portion was re-exported.

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The electrolytic copper refinery at Trail, B.C., is now in operation. The plant is expected to produce about ten tons of copper daily. Canada is now producing refined copper. How much longer will it be before we can report that Sudbury copper and nickel are being refined in Canada?

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From the record of exports of nickel from Germany, it is obvious that metal firms in that country handled much of the nickel used in other European countries. Germany thus had constantly more nickel than she needed for peace purposes. Canada should not permit such traffic being resumed.

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## MANITOBA'S MINERAL RESOURCES.

Mining men in all parts of Canada have followed with interest the development of the recently discovered mineral deposits in Manitoba. Rice and Gold Lake on the east, and The Pas district on the west have been visited by many mining men during the past year. It is generally believed that Manitoba will from now on figure more largely in the mineral industry of Canada.

In our August 1 issue we published an article by Mr. J. S. DeLury, of the University of Manitoba, on the eastern Manitoba gold area. Mr. DeLury, with Dr. R. C. Wallace, has recently visited The Pas district and for this issue of the Journal has given some account of the mineral deposits of the area. Our readers will be interested in the map which accompanies Mr. DeLury's article. It shows the result of the recent boundary survey.

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## EXPORTS OF NICKEL TO UNITED KINGDOM.

Exports of nickel, fine contained in ore, matte or speiss from Canada to United Kingdom during the 12 months ended March 31st, 1916, 11,610,100 lb., valued at $1,779,801. (The weight given is that of the nickel contents, not the gross weight of ore, matte, etc.)

For the three months ended June, 1916, exports under this item were 1,959,000 lb., valued at $297,015.

The values given are those reported by the Department of Trade and Commerce. The actual value of 11,610,100 lb. nickel in matte would be about $3,000,000

# MR. FERGUSON ON NICKEL

At a meeting in the interests of Mr. James A. Norris, Conservative candidate in the South-west Toronto bye-election, the Minister of Lands, Forests and Mines foreshadowed a tax on the nickel industry which would be more favorable to the Province, and which would be made retroactive.

In the course of a speech dealing almost entirely with the nickel question, he said:

"At the present day the Nickel Commission are dealing with that question, and I can say this to you, without disclosing improperly any information as to what the Commission are doing, that we are pretty well satisfied we have got an improved and equitable method to meet the whole mining situation, with a better tax in the future. So far as the nickel situation is concerned, when legislation is brought down making a new tax next winter, that legislation will say that, so far as International Nickel is concerned, it will be retroactive, just as Sir Thomas White's war taxes were retroactive, and we will get a fair share of the profits."

With reference to the statement that twenty-five per cent. of the stock of the International Nickel Company was in the hands of the Krupps of Germany, Mr. Ferguson said he was prepared to show that not only not twenty-five per cent., but not four per cent. of the stock of the International Nickel Company was held by any German or Austrian. The Minister charged that practically every acre of valuable nickel this Province possessed was given away to private corporations by the Liberal Administration, whereas the present Government, since it came into power, had not given one solitary acre of its nickel lands to any other than the private prospector. Hon. Mr. Ferguson referred to the discovery in the Province of a successful commercial process for the refining of Ontario ores, and said that, as a result of the Nickel Commission and the chemists and metallurgists who worked with them, they had to-day both the large companies coming to the Government and saying, "We are prepared to come into the Province of Ontario and refine our nickel." Mr. Ferguson added, "We are to-day negotiating with them for the development of power for this very purpose."

Regarding the talk about an embargo on nickel, Mr. Ferguson declared the Allies at one time in this war were largely dependent on the munition factories in the United States for supplies. The British Empire undertook to make contracts with firms in the United States, and with reference to nickel the British Government practically took charge of the operations of the International Nickel Company and they are operating that to-day.

"Not one ton of nickel," declared the Minister, "goes out of the refinery the order for which is not submitted to the British Admiralty and approved before it is sent out. Not one ton of nickel matte goes out of this country except by license of the Dominion Government, whereby it can be traced to its ultimate end, where it is turned out in the form of munition supply."

Regarding the supplies on board the Deutschland, the Minister said "the Dominion and Provincial Governments to-day know just how much nickel there was on the Deutschland, just where it came from, what its source was, and we know it never came from the International Nickel Company."

Mr. Ferguson, in vigorous terms, denounced what had been written on the subject by W. F. Maclean, M.P., "Mr. Maclean has been repeating over and over again that nickel has been getting to the enemy through International channels. I challenge Mr. Maclean or any other man in the Dominion of Canada to put his finger on one tittle of evidence that such is the case. These are merely vaporings and fabrications."

# MR. DEWART ON NICKEL

A speech made by Mr. Hartley Dewart, in Toronto, on August 17, is reported by the "Toronto World" as follows:—

"A big meeting at the Orange Hall cheered Hartley Dewart, the Liberal candidate, to the echo, last night when he flayed Howard Ferguson and declared that his days at Queen's Park were numbered, and followed with breathless interest the sinister trail that links Hon. Frank Cochrane to the International Nickel Co., together with his understudy, Mr. Hearst, his candidate Mr. Norris, and his newspaper, The Toronto News. Every statement so far made in this campaign by the Minister of Mines in the defence of the Government nickel policy was taken up, carefully analyzed and torn to shreds by the Liberal candidate. Mr. Dewart showed from the official returns of the U. S. Department of Commerce, that Canadian nickel had been steadily passing through the United States to Germany ever since the war commenced. The official figures he gave include the fiscal year ending June 30, 1916, and they leave no reason to doubt that the Sudbury nickel refined in New Jersey by the International Nickel Company is going every day to Germany to manufacture munitions.

"Mr. Dewart reminded his hearers that the Department of Mines for ten years past had been under the personal control of Hon. Frank Cochrane. Mr Cochrane held the office himself for years, then passed it on to Mr. Hearst, and when he promoted Mr. Hearst to the Premiership, he put Howard Ferguson as his understrapper in charge of the department. During all these years the Canadian Copper Company of Sudbury, was a large and constant customer of the Cochrane Hardware Company. A. P. Turner, the president of the Canadian Copper Company, was one of the directors of the Cochrane Hardware Company. Another director of that company was a Mr. Hillery, who holds in his own name 472 shares of stock in The Toronto News of the par value of $100 a share, and also 300 shares in trust. Mr. Cochrane, Mr. Dewart declared, was interested not only as a stockholder, but also a bondholder of The News Company, and his representative on the board of directors was Mr. James A Norris, the Conservative candidate in Southwest Toronto. Mr. Norris, he said, held one share of stock and was evidently on the board as a mere stool-pigeon.

"We did not have access to the books of the International Nickel Company, Mr. Dewart declared, but they would no doubt show the intimate relations existing between Mr. Cochrane and the nickel company. Mr. Cochrane was a creature of that concern. It put him in the Whitney Cabinet, and it made him a power in politics. To serve the interests of that company he kept an iron grip on the Ontario Department of Mines. The man who happened to be Minister of Mines to-day looked up to Frank Cochrane as his master. Mr. Cochrane to-day was putting in another of his hired men as a representative of the Legislature for Southwest Toronto, and public opinion was being chloroformed and poisoned on the subject of nickel by his newspaper. The Toronto News

"Coming to the question of Canadian nickel going to Germany, Mr. Dewart said that practically all the nickel ore imported by the United States since 1910, had come from the Sudbury district and had been brought into the country for refining purposes by the International Nickel Company and these imports amounted to 17,000 tons in 1909, 22,000 in 1910, 24,000 in 1911, 26,000 in 1912, 35,000 in 1913, 36,000 in 1914, 30,000 in 1915 and so forth. All this tremendous quantity from Canada was refined by the International Nickel Company in New Jersey, which exported a large proportion of it in the shape of refined nickel. If we took the United States export figures for refined nickel we could be sure that they represented nickel mined in Ontario by the Canadian Copper Co., and refined in New Jersey by the International Nickel Trust. The export figures showed immense shipments to the central powers while they were preparing for the great war. Thus in 1909 the United States exported to Great Britain and France only 762 pounds of refined nickel, while she sent to Germany and Austria no less than 6,640,000 pounds. The figures were then given for the following years up to the outbreak of the war. In 1913, for example, 9,000,000 pounds had been shipped to Germany, all of it refined from Canadian ore.

"But more startling figures were to follow. Mr. Ferguson had stated in a substance that any one was 'a dirty low-down cur,' who said that any Canadian nickel had been exported except to the Allies during the war, and yet the United States Department of Commerce reported that in 1914, 14,500,000 pounds had been exported to other countries, notably Sweden, Denmark and the Netherlands, all contiguous to Germany, and all more or less subject to German influence and control. In 1915, the export of refined nickel from the United States to Great Britain and her Allies amounted to 19,500,000 pounds, but in the same year 10,000,000 pounds went to other countries. For the first six months of the current year—1916—1,800,000 pounds of refined nickel had been exported by the United States to other countries. All this nickel must have been refined from Canadian ore by the International Nickel Co. From this conclusion no escape was possible."

Discussing the figures gleaned from the American blue books, Mr. Dewart said:

"Take the American returns and what do you find—that the exports of the refined nickel from the United States to Belgium, France and Great Britain amounted in 1909 to 762,000 pounds, while the export to our enemies, Germany, Austria and through the Netherlands by canal boat to Germany, amounted to 6,640,000 pounds—nearly ten times what our allies received, for in that year there was no export to Great Britain at all.

"In 1910 there was a considerable exportation to Great Britain, and she, with her allies, received 5,300,000 lbs., but our present enemies received in that year 7,700,000 lbs.

"What is the significance of these figures? It was the time of Germany's preparation. It was the time when the Krupps were busy with the munitions of war that were being prepared both for rifle and for artillery. It was the time when Hon. Frank Cochrane was the responsible Minister administering this department, in which his friends of the International Nickel Company were so vitally interested.

"But that there may be no mistake let us take the last four years and what do we find? The imports of nickel or of nickel matte to the United States were practically all from Ontario. What were the exports?

"In 1913 to Great Britain and France 13,000,000 lbs. To the Netherlands (meaning Germany), 9,000,000.

"To other countries, including Sweden, Norway, Denmark, Italy and Russia, 5,000,000 lbs.

"In 1914 the whole 56,000 tons of matte that the United States received came from Canada. France and Great Britain received 13,000,000 lbs. of the refined nickel.

"The Netherlands, 2,300,000, and the other countries, including Sweden, Norway and Denmark, which we now know to have been the avenues of trade through which supplies of every character reached Germany, 14,500,000 lbs.

"In 1915 the United States received its nickel matte solely from Canada. From the United States there was exported to Great Britain and France, 19,500,000 lbs.

"To the Netherlands 22,000 lbs., and to other countries still, including Sweden and Norway and Denmark, Italy and Russia and South America, 10,000,000 lbs.

"In 1916 during the nine months ending March, 1916, for the United States year to which I have referred runs from July to June 30th, and the figures must be therefore taken as of June in any completed year, there was exported to France and Great Britain 10,300,000 lbs., while the Netherlands still received 132,000 lbs., and the other countries, exclusive of our allies, Italy and Russia, 1,800,000 lbs.

"Mr. Ferguson said on Tuesday night that not one pound of nickel goes out of the International Nickel Company's refinery that has not been approved by the British Admiralty. His statement is unverified and unreliable. Will he account for the exports to our enemies in 1914-1915-1916, amounting in these three years to 29,000,000 pounds of nickel to countries other than Great Britain and France? Will he account even for the 2,000,000 pounds exported in nine months up to March, 1916, to other countries than the allied nations of Great Britain and France and Russia and Italy?

"The people of the Province of Ontario want something more than the random statement of a minister who is hard pressed and who does not submit one solitary figure, give the name of an individual or any record or authentic statement from any source to substantiate his general theory, or show where the 29,000,000 pounds of refined nickel went in the last three years that did not find its way to Great Britain and France."

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## BRITISH-AMERICAN NICKEL.

Sudbury, August 19.—The British America Nickel Corporation, owners of the Murray Mine and other nickel properties in the district, has acquired the water power on the Wahnapitae River at Twin Chute, about four miles above Wahnapitae village, and a force of men is already at the preliminary work towards developing the power. It is expected that from the plant to be erected about 6,000 horse power can be developed, and it is figured that by the time the work is completed and the power transmitted at the Murray Mine, the cost will reach in the neighborhood of $1,500,000. It is understood that about 300 men will be employed in the development of the power plant alone and that the job will be pretty well completed within a year.—Sudbury Mining News.

# THE MINERAL BELT NORTH OF THE PAS, MANITOBA

By J. S. DeLury.

The area described under the above heading includes a wide belt of mineral-bearing pre-Cambrian rocks extending from Amisk or Beaver Lake in Saskatchewan easterly to and beyond Wekusko or Herb Lake in Central Manitoba and showing at many points throughout its length, deposits of mineral, some of which should in the future prove of economic importance.

To the south this belt passes under the almost undisturbed palaeozoic limestones. To the north there is a continuation of pre-Cambrian rocks, the possibilities of which as sources of ore have yet to be demonstrated.

As would be expected, the country as a whole gives evidence of extensive glacial erosion. Doubtless the whole of the mineral belt was at one time covered by palaeozoic limestones and to the protection by these from glacial and pre-glacial erosion we owe the abundance, throughout this belt of residual Keewatin-Huronian outcrops.

In company with Dr. Wallace of the University of Manitoba, the writer recently made a three weeks' trip through the belt, and while little that was new could be learned from so extensive an area in such a short time, a few items of interest may be added to what has already been published on this field, and the accompanying sketch map may be useful in showing the readers of the Journal the locations of the different deposits. There is one feature of special interest in the map, namely, that it shows fairly accurately the positions of the sulphide ore bodies of Flin-Flon and Schist Lakes with respect to the new provisional Manitoba-Saskatchewan boundary line as determined recently by Mr. F. H. Kitto of the Surveyor-General's Department. Any merit this paper and map may have is largely due to the hearty co-operation of Dr. Wallace.

Reports* have been issued by the Canadian Geological Survey embracing the whole and various parts of this area, but being the results of reconnaisance surveys, the information they give is valuable to the prospector only as indicating the possible mineral-bearing formations and the travel routes. Dr. Bruce of the Dominion Survey has been working in this field for the past three field seasons and it is certain that his report and map will be of great value to those working in the district, and they are being anxiously awaited.

The important prospects on the Manitoba side of the boundary were all visited, leaving little time for noting other than the most general geological features of the area. A rough outline of the geology of the country, compiled from survey reports and from the writer's observations, follows: As in similar areas in Northern Canada, there are isolated patches of Keewatin-Huronian rocks, surrounded and underlain by Laurentian and other granitic intrusions. They are commonly spoken of as inclusions, but in most cases are best regarded as residual parts of extensive formations which have been largely removed by erosion. As pointed out above the large residual areas in this area are best explained as resulting from the protective influence of palaeogoic limestones.

There are without doubt both Keewatin and post-Laurentian rocks in the field and there are evidences of several periods of igneous intrusion, but the rocks are not easily differentiated except in places where contacts are seen. A great variety of rock types is presented, and while locally their relative ages may be determined, it is almost impossible from the information obtainable to give a comprehensive idea of rock correlation over the whole area, on account of the wide variety of types, the similarity of different types, the great variations in short distances and the intense metamorphism which nearly all have suffered. Bruce has listed the pre-Cambrian formation as follows:

Granite, Porphyry, Granite, Granite Gneiss.

Intrusive Contact—Jasper Conglomerate, Argillite, Arkose, Recrystallized Arkose, Conglomerate.

Unconformity—Granite (occurs as pebbles in the Conglomerate), Diorite, Greenstone, Pyroclastics, Autoclastics, and derived Schists.

This list will give a general idea of the nature and variety of the rocks of the area and the map accompanying McInnes' report will furnish the reader with the locations of the more extensive non-granitic formations. Beyond this bald statement, the geology of the belt will not be considered except briefly in its relation to the ores.

All the rocks of the area, except some of the latest intrusions, show a schistose or gneissoid structure with a strike of schistosity nearly north and south. This and the facts that there are many igneous intrusions with contacts parallel to the schistosity and that the dips are very high, being near the vertical in most cases, indicates that intense folding, probably accompanied by igneous intrusion took place over the whole area. The structure suggests isoclinal folding and hence that the schistose formations are apt to be repeated in belts parallel to the strike of the rocks. Though there are several types of deposit throughout the district, generally speaking the ores of the area are sulphide replacements or quartz veins in schistose rocks, the ores and veins being generally parallel to the schistosity of the rocks. Many of the rocks of the area even when not close to known ore-bodies, show considerable sulphide mineralization. Some of the schists are of sedementary origin, including sericitic, staurolitic and garnetiferous varieties. Others are of igneous origin, felsitic and porphyritic, and to others it is difficult to ascribe a definite origin.

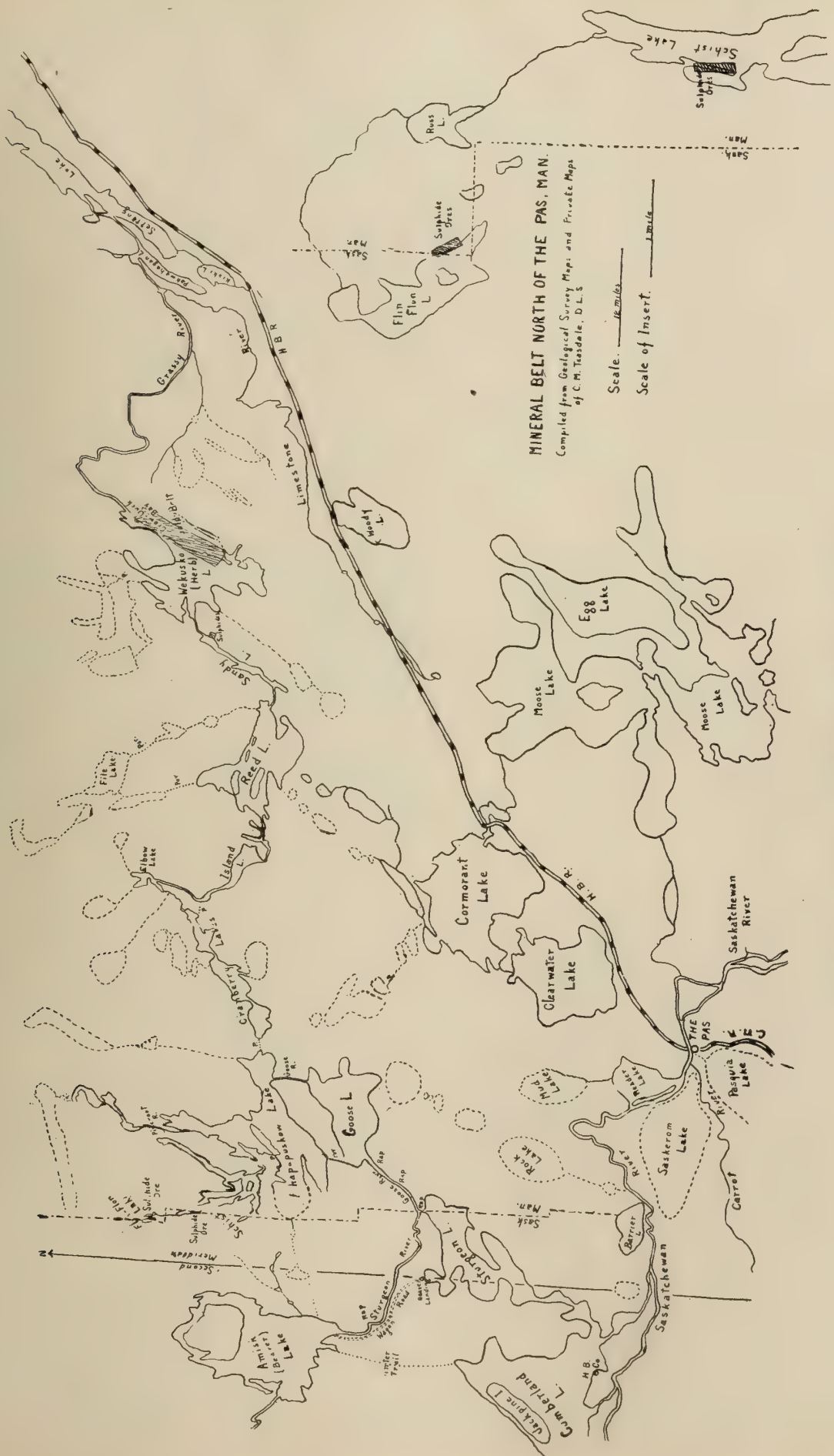
### Sulphide Deposits.

Of all the prospects in the area, most interest has centred on the sulphide ore-deposits of Flin-Flon and Schist Lakes. Both of these deposits are on the shore near lake level and the limit of what could be shown by surface work was soon reached. However, during the past season, two American companies have been investigating these properties by means of diamond drills.

### Flin-Flon Claims.

On Flin-Flon Lake considerable trenching and diamond-drilling has been done on two claims, the Apex

*Annual Report, C. G. S., Vol XIII.
North-Eastern portion of the District of Sask. and Adjacent Parts of Districts of Keewatin. By J. B. Tyrrell.
Geological Explorations in Athabasca, Sask., and Keewatin Districts. By D. B. Dowling.
Memoir No. 30, C. G. S.—
Basins of Nelson and Churchill Rivers. By W. McInnes.
Summary Report, C. G. S., 1915—
Amisk-Athapapuskow Lake Area, Northern Sask. and Northern Man. By E. L. Bruce.




MAP OF THE AREA NORTH OF THE PAS, MANITOBA.

and Unique. The ore consists of partially replaced schist grading into bands of sulphides of which pyrite, chalcopyrite and sphalerite are the more abundant and galena and arsenopyrite in small quantity. There has been considerable oxidation on the surface, the mixture of rock and sulphides weathering more readily than the massive sulphide bodies. It is said that there are considerable gold values in the sulphides, the free gold has been found in some of the drill cores and that the surface oxidized material will yield gold in the pan. The ore body is obviously a replacement deposit and as in most replacements, the ore is somewhat irregularly distributed throughout a wide mineralized zone.

The banded nature of the ores can be ascribed to changes in the ore-bearing solutions and successive replacements of layers of the fractured rock zone. In places on the weathered surface of the ore-body, the mineralized rock has been entirely leached of its sulphides and there is left a thoroughly bleached pumice-like mass of rock. The irregularity of the ore-body makes it impossible to give tangible dimensions. The replacement zone has in one place a width of close to 200 ft. and indications of ore are found throughout a length close to 2,000 ft.. Wide bands of solid and mixed sulphides are found in most of the trenches and these are always accompanied by rock rich in sulphides. Drills have cut the ore-body at several depths up to 500 ft., but no authentic information could be obtained as to the size or nature of the body at these depths. The schist carrying the ore appears to have been a rather basic felsite. There are several varieties of rock in the vicinity, including schistose gabbro and quartz-porphyry and a rather fresh looking granite dyke which grades into quartz-porphyry on the edges. No connection of any of these rocks with the origin of the ores were established. The ore-bearing schist strikes a little west of north and is nearly vertical, having a dip of about 80 deg. east. The ore appears to follow the strike and dip of the enclosing rock.

### Schist Lake Claims.

On Schist Lake is a sulphide ore-body that is very similar to that on Flin-Flon Lake. Trenching has showed up a very wide mass of pure chalcopyrite with accompanying bands of pyrite and sphalerite and mixtures of these. Surface weathering as at Flin-Flon, has resulted in the formation of iron capping on the upper few feet of the ore and noticeable deposits of covellite and chalcanthite were formed. The nature of some of the partly replaced rock indicates that the ore was deposited in a zone which besides being quite schistose was also fractured. The ore-zone is not as large as on Flin-Flon, being, as far as has been determined, confined to a surface area somewhat less than 500 ft. long and 80 ft. wide, but in this are some large bodies of valuable sulphides. Drilling to depths up to 500 ft. shows that there is an extensive ore-body and that it is of the pockety nature of replacement deposits. The ore-body, following the rock, has a dip of about 75 deg. east and strikes a little west of north.

### Other Sulphide Deposits.

Both of these sulphide bodies appear to be large enough and rich enough to warrant that at some time they will be important producers. There are excellent chances for finding similar bodies along the same zone of fracture and for that matter, elsewhere in the district. Similar sulphides have been reported from the Pinroot R. country to the north and east of these deposits, and also on Arthapapuskow Lake. On Sandy Lake is a considerable impregnation of pyrite and possibly other sulphides in a graphitic schist, but the value of this is not known.

### Herb Lake Gold Prospects.

The country on the east side of Herb Lake has furnished the bulk of the promising gold prospects. In this area are found gold-bearing quartz veins which occur in a sericitic schist and in a schistose diorite or gabbro. With the quartz are notable amounts of tourmaline and a little carbonate gangue. Besides free gold, the veins carry sulphides which are largely arsenopyrite with some pyrite, chalcopyrite, sphalerite and galena. Mineralization is fairly constant throughout the length of the veins, but apparently less in proportion to the width in the wider parts. Free gold is rather persistent and in places there are quite rich showings. There is considerable arsenopyrite scattered in grains throughout the country rock adjacent to the veins. The veins run between a north-south and a north-east-south-west direction and are nearly vertical, following both the strike and dip of the country rock. They are irregular in width, thinning to a few inches in one place and widening to lenses up to 6 or 8 feet in another, while they seem to be fairly persistent in length wherever they have been stripped or cross-trenched, some of them having been traced in these ways for several hundred feet.

Considering the amount of prospecting that has been done in the area, the number of showings is remarkable and speaks well for the future of this part of the country. The relations of the quartz veins to the folded rock structures suggest that the veins may be followed into the troughs of synchins in which case there may be enlargements as frequently happens in quartz veins following similar structures.

### Molybdenite.

On Crow-Duck Bay, across from the gold deposits above described, is a quartz vein which has been opened up and traced for a short distance. It contains a considerable proportion of molybdenite, also orthoclase and tourmaline crystals, and a little pyrite and chalcopyrite. It is said to carry low values in gold. The vein is small and has not been traced for any great distance. The country rock is a quartz-diorite or quartz-monzonite with a gneissoid structure. In the same bay is a pegmatite dyke carrying considerable amounts of muscovite.

### Other Gold Deposits.

It has been known for many years that there are many gold prospects on Beaver Lake in Saskatchewan. It is also reported from Island Lake, from Little Herb Lake, north of Herb Lake and from the File Lakes, north of Reed Lake.

### Future of the Pas District.

On the whole, the showings made in this wide belt are both remarkable for their number and nature, considering the brief history of prospecting and developing and the writer feels that he is sufficiently conservative in predicting a bright future for further prospecting and future development.

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## MR. J. E. SPURR ON THE PAS DISTRICT.

"The greatest mining district in Canada," says Mr. J. E. Spurr, advising engineer and first vice-president of the Tonopah Mining Company, on his arrival in The Pas from an extended tour of the mineral area between Schist and Herb Lakes.

"That covers it," said the eminent geologist, as he boarded the train for the south. He avoided saying anything further on the subject, and also declined to

discuss the plans of the Tonopah. This company is diamond drilling a sulphide body at Schist Lake, where satisfactory results have been obtained, and a further exploration is going on. At Herb Lake the company are investigating a molybdenite deposit. Elsewhere in the mineral belt the Tonopah have interests which are being examined and tested with an eye to development. More money is being spent by this company in proving the mineral deposit of New Manitoba than any other concern in the field, and they have earned the good wishes of every man in the hinterland. It is evident from the expenditures already made, and the program outlined, that the Tonopah are here to spend vast sums of money in determining the mineral possibilities of which they seem to have the greatest confidence and faith. Whatever else may be done to promote the mining interests of New Manitoba, it is apparent that the Tonopah will outshine them all in point of bringing to realization the actual fact that here in this district are great deposits of precious minerals in unlimited quantities. That is the attitude of the Tonopah engineers, led by Mr. Spurr, and the people of The Pas are grateful and appreciative of this spirit. —The Pas Herald.



FLIN-FLON CAMP.



AFTER CROSSING BEAVER LAKE, 53 BELOW.



AT POLICE SHACK, BEAVER LANDING.
Constable Douglas, Mr. Hammell and Mr. Robinson.



FLIN-FLON CAMP.
From Left—Tom Creighton, Dan Mulligan, Leon Dion, Jack Hammell, Isador Dion and Jack Mosher.

## PROF. WALLACE ON THE PAS DISTRICT.

"Heavier veins, more lenticular and greater mineralization in the country rock than at Rice Lake," is the opinion of Professor Wallace regarding Herb Lake.

Professor Wallace has spent three weeks in the mineral belt of the north, on behalf of the Provincial Government, and his report will set forth his conclusions, which he says are decidedly favorable in every way. The mineralized area he puts at 125 miles in length and 25 miles wide, extending from Flin-Flon to Herb Lake, and showing outcroppings of sulphides throughout. He declared to The Pas Herald that the sulphide discoveries already made are more accidental than anything else, and a vigorous campaign of prospecting would reveal larger ore-bodies than those found at Flin-Flon and Schist, though they are, he says, wonderful properties as it is.

Gold, copper and zinc were the chief minerals encountered by the Manitoba University professor of geology, and to these three he looks forward to the bulk of production. Lack of prospectors was lamented by Mr. Wallace, and he will give particular emphasis to this point in writing his report to the Government. These views are similar to expressions given out by Mr. J. E. Spurr, of the Tonopah, and both geologists appear to agree that the entire district is one of great mineral promise that can be only uncovered by diligent prospecting and development.

Professor Wallace was accompanied by Associate Professor De Lury, and Hay Stead, a well known journalist, who will write a series of articles on the district for the Winnipeg Telegram. Mr. Wallace's report will appear in the Winnipeg Free Press as well as other papers, and mining men in The Pas are waiting for it with considerable interest.

The owners of the Kiski and Rex claims at Herb Lake were congratulated by Professor Wallace for the manner in which they had opened up the veins on their respective properties, which was characterized as intelligent work and most advantageous.—The Pas Herald.

# A NEW FLOTATION OIL*

By Maxwell Adams.

Considerable interest has recently been developed in sage-brush oil because of its possible utilization as a flotation agent in the mining industry. A list of some of its physical properties, together with the method used in its extraction, may prove of interest at this time.

Something over a year ago, a study of the essential oils in desert plants was begun in the Chemical Laboratory of the University of Nevada. None of the oils so far studied possess properties of special interest to engineers, except the oil of sage, Artemesia tridentate which has exceptional power as a flotation agent. This plant, known as common sage brush, also called black sage, is widely distributed over the semiarid West, being found quite generally on most of the dry plains and mountains west of Missouri.

The method of extracting the oil followed in these experiments is very simple. The leaves, twigs and small branches are placed in an air-tight drum, having a capacity of about 27 cu. ft. Steam is admitted through a number of small openings at the bottom of the retort, and the pressure maintained at 20 to 25 lb. per sq. in. for 3 hr. The escape of the steam from the retort is regulated by allowing it to pass through a stop-cock into a condenser. The water in the receiver is drawn off from time to time and the oil, which is insoluble and floats upon the water, is thus collected. At the end of 2 hr. most of the oil has been driven out, though traces continue to come over for a much longer time. By raising the pressure, the time required could probably be shortened and the yield increased, but the lack of laboratory equipment has prevented the carrying out of this experiment.

The stock wood, bark and branches contain no oil, the distribution of the oil being limited to the leaves and young shoots. There is a seasonal variation in the amount of oil contained. Samples collected on different dates gave the following amount of oil: May 1, 0.42 per cent.; May 27, 0.6 per cent.; June 30, 0.72 per cent.; Aug. 1, 0.9 per cent.; Sept. 10, 1.0 per cent. The increase appears fairly constant from early spring, when the leaves first appear, until light frosts occur in the autumn. When the plant is air-dried there is some loss of oil, as the following data will show: Two 100-lb. samples were collected at the same time. One was distilled when green; the other was air dried for 10 days before distillation. The green sample yielded 275 grams, and the dried sample 248 grams of oil, showing a loss of about 10 per cent.

A laboratory experiment can furnish little data useful in forming an estimate of the commercial cost of production. A man working for 6 hr., and using a pair of common pruning shears, collected twigs which yielded 1 lb. of oil. Since only a small percentage of the oil is lost if the brush is dried, the most economical method of production would perhaps be to collect it in large quantities, by using a tractor engine and a drag, in some such way as land is cleared for farming. When the brush is dry, the leaves and young shoots are easily shaken from the limbs. Thus the amount of material to be distilled would be greatly diminished and the oil perhaps obtained at a cost and in quantity sufficient to make it available as a flotation oil, if not alone, possibly as an ingredient, to increase the flotative power of other oils.

The crude oil is dark in color. When redistilled with steam it is water-white at first, changing gradually to a straw-yellow color upon standing. It has the following physical properties: Density at 15 deg. C., 0.9206. Refractive index at 20 deg. C., 1.4732. Rotation at 20 deg. C., —4.69. At 98 deg. C., a light oil, with a very sharp and pungent odor, begins to distill, but only after the temperature is above 165 deg. C. does rapid distillation take place. At 180 deg. C., the oil turns dark and decomposition begins. At a pressure of 12 mm., and below 125 deg. C., almost all the oil can be distilled.

The chemical properties of the oil are as yet undetermined. There are small quantities of alpha and beta pinene. The main part of the oil has a camphor-like odor and taste, but has failed to give the ordinary tests for ketones. The fraction boiling at 175 deg. to 180 deg. C. has some of the properties of ordinary cineol, but is acted upon by metallic sodium, which indicates that the chief ingredient is not cineol. The chemical composition, which has little interest in this connection, will be worked out later. The important question for the engineer is: Can the oil be produced in quantity and at a cost that will make it available for ore flotation?

*A paper to be presented at the Arizona Meeting, September, 1916, American Institute of Mining Engineers.

## COAL MINE DISASTER AT MICHEL, B.C.

A series of explosions took place in No. 3 mine of The Crow's Nest Pass Coal Co.'s Michel colliery, in the Crow's Nest district of South-east Kootenay, B.C., on the night of August 9, and as a result twelve men lost their lives and the mine was badly wrecked. Mine-rescue crews from both Michel and Coal Creek entered the mine, but they found the workings blocked by great falls of rock, so were unable to reach the parts where some of the unfortunate miners had been working. By the 16th of the month seven bodies had been found and removed from the mine. The cause of the disaster has not yet been ascertained, but it is believed that during an electrical storm that was raging in the neighborhood at the time, the lightning being severe and coming low down, a heavy current of electricity must have followed the steel rails of the track into the mine. The Chief Inspector of Mines for the Province hurried from Victoria to Michel, to make investigations, and to take preliminary steps to hold an inquiry into the circumstances attending the explosions.

Last year the Coniagas put in a cyanide plant to treat decomposed ore in the form of slime. From three to four tons was washed out every 24 hours of material that will run about 150 oz of silver. This plant gives an additional profit of from two thousand to twenty-five hundred dollars a month. Previously the concentrates were shipped to smelters. In all probability this practice will be continued after the flotation plant is installed. Slime tailings last year ran an average of 6.3 oz., but this has been reduced to below 4.5. It is thought that flotation will make an additional recovery of from three to four oz. per ton.—Northern Miner.

# A FEW NOTES ON CALLOW FLOTATION

By A. G. Morrison.

In the hope that other persons will write of their experiences in connection with the practical operation of Callow Flotation Cells the writer has prepared a few notes on his experience in the flotation of chalcopyrite.

Volumes have been written concerning the theory of flotation, but after wading through many articles on the colloidal chemistry of flotation, and reading one article by an eminent writer stating that most minerals are negatively charged, and another article stating that the pulp should not be emulsified, and finding both of these statements refuted by J. M. Callow (see Canadian Mining Journal, December 1st, 1915), one loses hope of learning anything from the prophets.

Two solid facts stand out very clearly, however. The first is that no one can as yet explain the why of flotation and that all attempted explanations can be reduced to the electrolysis theory and the contact angle theory. The second is that no predetermined kind or quantity of oil can advantageously be used on any given ore. This gives the novice a certain amount of encouragement, for all can at least start even. The writer has been connected with the use of the Callow cell on chalcopyrite ores and writes from that standpoint only.

The first trial of oil was with 55 per cent. of coal tar, 35 per cent. wood creosote and 10 per cent. pine oil. This gave a fairly satisfactory froth of a dirty grey color. After considerable experimenting it was found that pine oil could be dispensed with, providing the air pressure was sufficient. The oil finally used was 55 per cent. coal tar and 45 per cent. mineral creosote instead of wood creosote. The air supply was obtained from a Root blower of an old type which hardly gave enough pressure, the result being bubbles from ⅛ inch to 2 inches diameter. These were too large since the smaller the bubbles the more surfaces there are to carry the ore. The blower being run from the main drive necessarily stopped when the engine stopped.

To supplement this, air was carried from the compressor (100 lbs. at the compressor end) a couple of hundred feet through a ½-inch pipe to the cell, the only protection against a blowout being a valve at the cell end of the line. This valve was opened just sufficient to give the right pressure at the cell. This gave a stronger pressure, allowing the cell to start much more quickly, if for any reason it was stopped, and also decreased the size of the bubbles, thus offering more surface for the ore to cling to. It was not a very economical process for it took a high pressure to drive the air through the ½-inch pipe.

The ore was ground so that 90 per cent. would pass 100 mesh. Under the microscope the chalcopyrite showed as somewhat rounded angular particles clean from rock and gave every indication of separating cleanly from the rock even when not ground so finely. The ore was mixed with water in the ratio of 1 to 4.

There are four fundamental conditions necessary for good results. First, the ore and water feed must be in exact proportions, i.e., in the same ratio, otherwise the oil feed must be changed to meet the changed conditions Secondly, the feed of the pulp into the cell must be constant, for although the float more or less compensates for a changing feed, its action is somewhat slow, and this prevents the even slopping over of the concentrates, and if a cell goes out of action for any reason, it often takes considerable time to get it going again. Thirdly, the oil feed must be regular. Fourthly, the air pressure must be steady.

Given these conditions, cells will work steadily with little or no attention. Under a heavy feed the cells muck up about twice a week when they must be emptied and the mud scraped off the blankets. Some authorities advise blowing air through the blanket till it is dry, and then beating it with a piece of belting till all the dust is out of it. This is very effective, but just at present when it takes so long to replace the blankets, owing to the slowness of the manufacturers, it is not to be recommended unless one has a good supply on hand.

The first oil feeder used was merely a barrel having a steam coil for heating and an ordinary valve to allow the oil to drip into the pulp. This caused endless trouble as a constant feed could not be maintained. This was replaced by a wheel, the rim running in the oil at about 10 feet a minute velocity. A square piece of tin pressing against the rim scraped off the oil. The tin was slid along the face of the wheel until there was sufficient contact between the two surfaces to collect the required amount of oil. The tin was attached to a wooden block run in grooves.

The oil container was a shallow tin pan and gave some trouble at first because the oil stratified and only the light frothing oils came off. This difficulty was overcome by changing the oil occasionally.

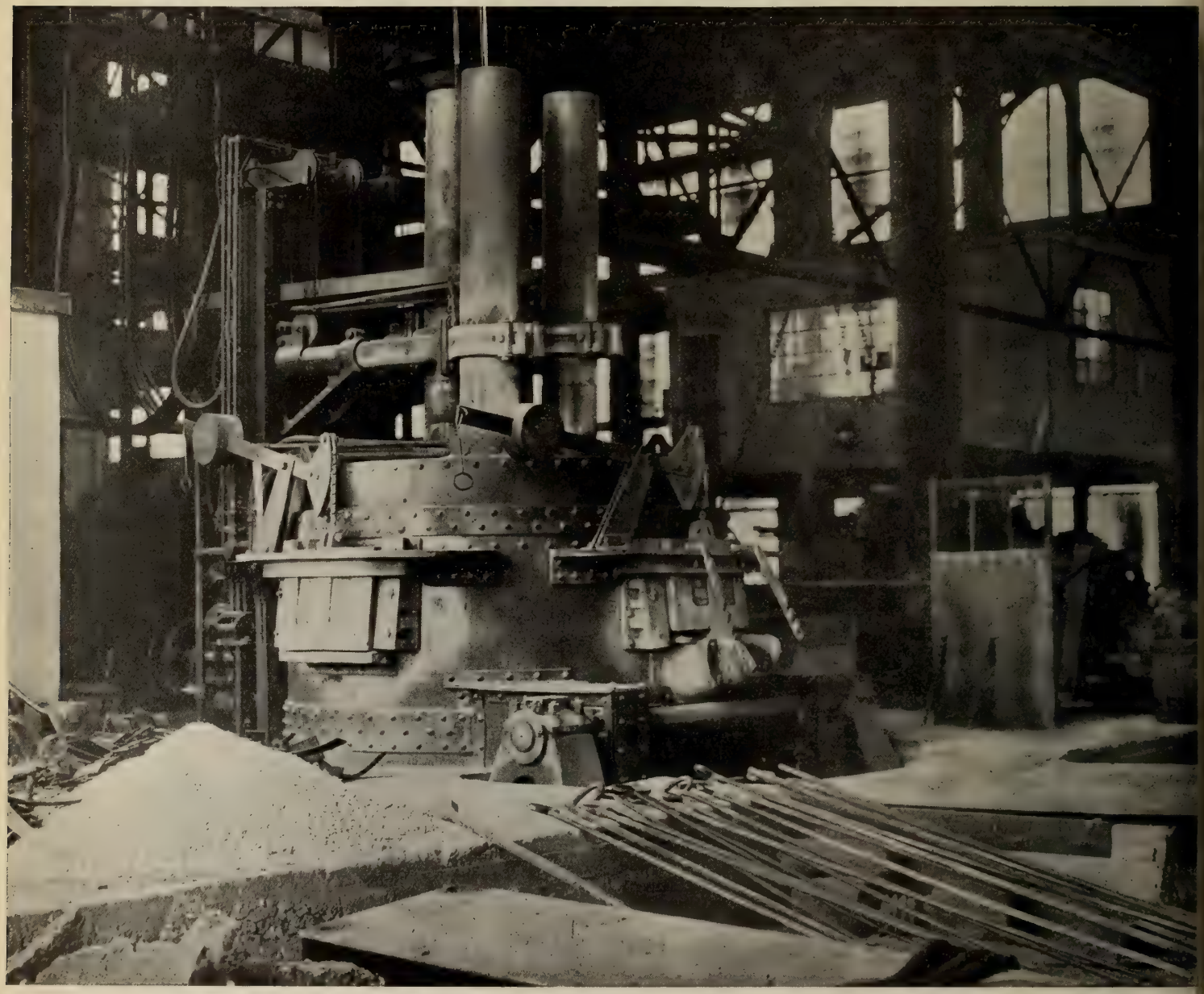
A good point to bear in mind is that the cells should be located so that the man in charge can readily see into them, to be sure that they are overflowing properly. This necessitated a climb down a ladder to get at the air valves underneath the cell. This is a handicap, as the idea must be to have one man attend as many cells as possible. Since human beings are frail, if there are many ladders to climb in a day some of the cells will be neglected. A worm or bevel gear attachment which would allow the valves to be operated from the top of the cell so that the man can at once see the result, would be an improvement.

Observations of the flow of the froth indicate that it is from top to bottom end of the cell with a tendency to go to both sides. This indicates the necessity of having the lower end of the cell overflowing at all times otherwise there will be a considerable loss in the tailings.

A fact not generally known is that a single cell can be used both as a rougher and a cleaner cell, by throttling down the upper air valves and allowing the lower end of the cell to overflow. The froth (in the case of chalcopyrite) will then change from a dirty grey to a beautiful copper yellow. The production will be cut down about one-half and the grade of the concentrates doubled without making any appreciable difference in the tailings. This is, however, far from fool proof and must be given closest attention.

## MANUFACTURE OF DRILL STEEL IN CANADA.

Armstrong, Whitworth of Canada, Ltd., has now in operation a "Heroult" electric furnace for the manufacture of high grade carbon steels. The company is now in a position to make all grades of carbon and alloy steels of a quality that have not heretofore been manufactured in Canada. This includes "Awco" mining drill steel, which is giving very excellent results in rock drill work, etc. The electric furnace has come into prominence in the last few years, and manufactures a very pure steel owing to its refining qualities.



ELECTRIC FURNACE AT ARMSTRONG, WHITWORTH PLANT.

Armstrong, Whitworth manufacture high speed steel in crucibles, as it is well known that this class of steel made in crucibles is of the highest quality and gives the best results.

The company is installing two additional electric furnaces of 6 ton capacity each in connection with a new plant for the manufacture of locomotive and car wheel tires, rolled steeel wheels, special heavy forgings, etc. They expect to have this new plant in operation next spring.

## A I. M. E. MEETING IN ARIZONA.

For the first time in its history of forty-five years the American Institute of Mining Engineers will this month meet in the State of Arizona. Sessions of the meeting will extend over the entire week of September 18th and will be held in the principal mining centres of the State, the members travelling between the various points by special train and automobile. Principles of mining and metallurgy of the greatest interest will be presented at the technical sessions.

Some indications of the importance of this meeting to mining engineers is shown by the fact that a special train has been arranged for to carry Eastern members from New York city on September 14th. Other members and their guests will join the party at various points en route and at El Paso, Tex., the western section of the convening members, starting from Los Angeles, Cal., will meet the train and continue to Arizona.

The principal towns in which the Institute sessions or visits of inspection will be held are Santa Rita and

Hurley, N. Mex., and Douglas, Bisbee, Globe and Phoenix, Arizona. The inspections will include the Roosevelt Dam and the mines and works of practically all the leading metal-producing companies of the State. At Douglas, in the technical sessions, the Institute will discuss the special subject of "Smelting." At Bisbee papers will be read on "Mining and Geology," and at Globe the first day will be given over to "Mining and Smelting" and "Leaching." During the second day at Globe time has been set aside for what is regarded as an important discussion of "Concentration and Flotation."

The Institute now comprises more than 5,600 members and this meeting is designed to develop subjects of interest to all of these. In announcing the Arizona meeting an official of the Institute says: "A few years ago Arizona stood third in the copper-producing districts of the United States. Since that time, with the development of porphyry mines, the output has gone up with great rapidity until it not only is the leading district, but its output at the present time is at the rate of nearly double the Montana output, which now stands second in the list."

An elaborate entertainment program is being plan-



ELECTRIC FURNACE AT ARMSTRONG, WHITWORTH PLANT.

The company plants that will be visited are as follows: At Hurley, the mines and works of the Chino Copper Co.; at Bisbee and Douglas, the mines and works of Copper Queen Consolidated Mining Co., Calumet and Arizona Copper Co., and Shattuck Copper Co.; at the Globe district, mines and works of Inspiration Consolidated Copper Co., Miami Copper Co., Old Dominion Copper Mining and Smelting Co., together with the new works of the International Smelting Co.

ned by the Arizona Committee comprising Gerald F. G. Sherman, chairman; Arthur Notman, secretary; Norman Carmichael, W. G. McBride, John C. Greenway, W. L. Clark, B. Britton Gottsberger, and Forest Rutherford. The Committee on Transportation is composed of Walter Douglas, chairman Cleveland E. Dodge, secretary, Arthur S. Dwight, John C. Greenway and Julius Kruttschnitt, Jr.

# BOOK REVIEWS

**Economic Geology, by Heinrich Ries. Fourth Edition, revised and enlarged. Published by John Wiley & Sons, New York. Price, $4.00. For sale by Book Department, Canadian Mining Journal.**

Professor Ries' textbook on economic geology is well known. It is particularly useful on account of prominence given to the non-metallic minerals, on some of which Mr. Ries is an acknowledged authority. The section devoted to metallic minerals is compartively weak.

In this new edition the author has included descriptions of some Canadian mineral deposits. The descriptions are not remarkably good and the classification of the deposits is not designed to convey correct impressions. It may be well to point out some features of the descriptions which appear to us as objectionable.

First, let us take the case of the Cobalt silver deposits. Cobalt is the world's richest silver mining camp. We naturally look for a description of these native silver deposits in the chapter headed "Gold and Silver." Instead, the description is given in a chapter headed "Minor Metals," under the subheading "Nickel and Cobalt," thus conveying a false impression as to the character of the chief product of the Cobalt silver mines.

In describing the Cobalt silver deposits Mr. Ries says: "The important ores are native silver, smaltite and cobaltite. As a matter of fact, cobaltite is not one of the important minerals, and is only occasionally seen. The important mineral is native silver.

The greatest gold deposits discovered in recent years are those of the Porcupine district, Ontario. In the chapter on gold and silver one paragraph of four sentences is devoted to a description of the Porcupine gold deposits.

In this same chapter the gold deposits of Rossland are mentioned as follows: "The deposits at Rossland, B.C., referred to under copper, also yield an appreciable quantity of gold." The gold production of the Rossland district during 1915 was $2,947,439, while the copper production was 4,651,681 pounds. The relative importance would hardly be deduced from Mr. Ries' textbook.

Reference to the descriptions of some of the American deposits with which the reviewer happens to be familiar does not increase our confidence in the accuracy of Mr. Ries' descriptions. Of the Michigan copper deposits he says: "At the present time most of the production comes from the Calumet conglomerate, while the balance comes from two other copper-bearing conglomerates known as the Albany and the Allonez, and from the ashbeds and amygdaloids, whose gas cavities are filled with a mixture of native copper, calcite and zeolites." This sentence is full of errors. By far the greater part of the Michigan copper is being mined from amygdaloid lodes, the Kearsarge amygdaloid lode itself yielding more than the Calumet conglomerate. Aside from the Calumet conglomerate very little conglomerate ore is being raised. Comparatively little of the copper in the amygdaloidal lodes occurs in the form of filling of gas cavities, being chiefly present as a replacement of rock constituents.

Following the inaccurate statements contained in the sentence quoted above we find the following: "The Calumet and Hecla ore shoot, which is three miles long, 12-15 ft. thick, has been mined to a depth of 5,000 ft." This description of the Calumet ore shoot is almost as inaccurate as it is brief. Ore is being mined at the Calumet and Hecla property for a length of three miles on the conglomerate lode, but there is no continuous ore shoot of that length.

In the case of the more recently discovered districts it is not surprising to find very poor descriptions in textbooks. We expect, however, to find even in textbooks reasonably accurate descriptions of such long-worked and well known deposits as those of the Calumet conglomerate.

The author of a text book on ore deposits cannot be expected to be familiar with all the deposits mentioned. He has to depend upon written descriptions and is sure to make some mistakes in summarizing. We have here called attention to a number of unfortunate descriptions noted on brief perusal of this new volume. In spite of the fact that the book is in some respects unsatisfactory, it will doubtless find considerable use, especially by those studying the non-metallic minerals.

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# A ROLL OF HONOR

At noon of Friday, August 4, at the Western Fuel Co.'s machine shop, Nanaimo, Vancouver Island, British Columbia, there was unveiled a Roll of Honor comprising the names of employees of the company who had enlisted for active service in the war. Alderman Ferguson presided, and Mr. A. S. Hamilton, the company's master mechanic, who removed the covering from the roll, said: "Fellow employees: It is fitting that we should, on this the second anniversary of the great war, pay special tribute to those of our staff who responded to the call of the Motherland, and did, or are doing, 'their bit' for the sacred cause of Freedom and Justice. In the journey through life there is only one path by which we travellers may reach happiness and righteousness, and that is by acting on the square one toward another, man to man. Crime and injustice flourish but a short time; righteousness alone prevails. Nations being merely a collection of individuals, must be animated and governed by the same laws, and any violation of this sacred principle must be stamped out of civilization is to advance and prosper. It is this glorious and worthy cause for which our comrades are fighting; for this they have left their homes and gone thousands of leagues from us, ready to sacrifice their vigor and, if need be, their lives. We thank them now; generations to come will bless them, and the world will be the better that such men have lived. The list of names inscribed on this Roll of Honor is but a humble contribution to the hosts engaged, but these names are dear to us, inasmuch as they who bear them were our chums, our fellow-workmen, our friends, and we know what their sacrifice means. May we who remain at home be spurred on to further efforts in the much easier duty allotted to use of caring for those left behind, and may we never cease to be proud of this humble list of names of those who are representing our department in this great war." Mr. Hamilton then unveiled the Roll and read out the ten names inscribed thereon, one of them being that of one of their fellow-workmen who had been killed in action.

## DEATH OF HON. EDGAR DEWDNEY

The late Hon. Edgar Dewdney, who on August 8 died suddenly at his residence near Victoria, B. C., was one of a fast-passing band of pioneers who helped considerably to mould the destinies of that province. The Daily Colonist, of Victoria, published a lengthy obituary notice, from which the following has been taken:

"British Columbia was the scene of the late Hon. Edgar Dewdney's earliest exploits and most of his life's work was carried on within the boundaries of the province. In Victoria and throughout the community his loss is being deeply mourned. He died suddenly at his residence, Cadboro Bay Road. His death, which was due to heart failure, came as a great shock to his many friends, for he gave every appearance of being in his usual health until within half an hour of the end. He was seriously ill about a year ago, but while he had been somewhat weak ever since, he suffered no relapse and appeared to be regaining his former strength. He was down town the day before his death.

"Mr. Dewdney was 81 years of age. He was born in Devonshire, England; he received his education not far from his birthplace and qualified as a civil engineer. About the time he gained the certificate to practice his chosen profession, the richness of the Cariboo goldfields, in British Columbia, was attracting world-wide attention and the surrounding country was slowly but surely being developed in order to provide adequate communication to the mines for the prospectors and settlers attracted there from all parts of the world. It was therefore not unnatural that Mr. Dewdney made British Columbia the choice as the field of his labors.

"In the year 1859 he left England for the Canadian North-west, and upon his arrival here was almost immediately taken into the service of Sir James Douglas, Governor of the colony, and of Colonel Moody, R. E. He was engaged to lead a survey party to lay out the town of New Westminster, and in the undertaking, which was carried out with efficiency and dispatch, he gained the reputation which placed him in the favor of his employers. In 1860 he built the old Hope trail to Similkameen, which trail has stood the test of time and its route has only been slightly changed since Mr. Dewdney made the first survey more than half a century ago. That trail was to afford access to the placer-gold mines of Granite creek and of Tulameen and Similkameen rivers and tributary creeks, and it was at first intended to construct it as far as Rock Creek, in Boundary district, but that extension was not made until some time later. Mr. Dewdney did much work on roads near Princeton, in the heart of the Similkameen country, and where Keremeos was afterward established; he also built a trail to what is now Midway, near the mouth of Boundary creek, and this trail was used by prospectors in the neighborhood of that creek and of Rock creek.

During his term of office as Governor, Sir James Douglas conceived the plan of making a trail through the Similkameen, Boundary and Kootenay districts to the placer-gold field on Wild Horse creek and the regions to the eastward of what is now Fort Steele mining division, with the ultimate purpose of joining up with a waggon road from the eastward through the Rocky mountains. Eventually this work devolved upon Mr. Dewdney, who had shown by his capable performance of less important tasks to be the most reliable engineer obtainable at that time in the province. In 1865 the project was undertaken and before it was completed Mr. Dewdney had been compelled to undergo the hardest and most trying experiences, although under all conditions he showed himself to be fully equal to the responsibilities placed upon his shoulders. In the early spring of the year he proceeded to Fort Sheppard and thence to Wild Horse creek. With the aid of a few Indians, who acted as guides, he explored the Kootenay river from its source to Kootenay lake with the object of finding a means of utilizing a pass between Crawford bay, an arm of the lake, and St. Mary's river, which flows into the Kootenay near Fort Steele. When he broke his way through that country it was little less than a solid unbroken stretch of dense forest and the surveyors had to suffer many hardships while their task was being performed. Their courage and resource was taxed to the limit, but that they ultimately succeeded is testimony to their dogged determination and to the ability at all times shown by their leader, Mr. Dewdney.

"In a birch-bark canoe Mr. Dewdney and his party traversed Kootenay river to its junction with the Columbia, past Bonnington Falls, running through the rapids where they were found navigable and portaging where too strong a current, rocks, or falls, barred their passage. Before the expedition terminated a large number of Chinese had to be employed, and they were subsequently paid in gold dust. Mr. Dewdney and his party returned to New Westminster in September, 1865, after the trail had been broken. He was heartily complimented by the Governor on the work he had done; also for the satisfactory account rendered by him, the total cost of the vast work having been only $74,000. Ever since the trail was first declared fit for traffic it has been known as the Dewdney trail, in recognition of the fine record of its builder.

Mr. Dewdney became a member of the Dominion House of Commons in 1872. In the early part of 1879 he was appointed Indian Commissioner for the North-west Territories; in December, 1881, he became Lieutenant-Governor of the North-west, and he held the two positions conjointly. In August, 1888, he was made Minister of the Interior and Superintendent of Indian Affairs in the Cabinet of Sir John A. Macdonald, and he continued in office until October 16, 1892, when he retired. Later he was appointed Lieutenant-Governor of British Columbia, which post he held until November 5, 1897. Since his retirement from public life he has been occupied as a financial agent and has been actively associated with mining enterprises, chief among which was that of the Britannia Mining and Smelting Co., of which organization he has ben president for a number of years.

"The late Mr. Dewdney was very popular in both public and private life, and was held in high respect by all who knew him. No country produced a finer type of gentleman. He was a man of incorruptible integrity, and was public-spirited and far-sighted; he was one of the real builders of British Columbia, and his name will ever be closely associated with the history of its development.

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In the month of June, the Josie mine, of the Le Roi No. 2, Ltd., shipped to Trail 1,204 tons of ore. The receipts from the smeltery were $20,205, being payment for 1,893 tons of ore shipped; sundry receipts were $51. Total of receipts was $20,256. The estimated working costs for the corresponding period were: Ore production, $8,000; capital expenditure, $100; and development costs (including diamond-drilling), $6,500. Total costs were, therefore, $14,600.

# PYRITE MINING IN ONTARIO

In an article to be presented at the September meeting of the American Institute of Minng Engineers, Mr. P. E. Hopkins, of the Ontario Bureau of Mines, gives brief descriptions of the pyrite deposits in South-eastern Ontario and some general notes on pyrite mining in other parts of Ontario.

The earliest mining of iron pyrites in Ontario was done in 1868 on the Billings property near Brockville. The mines were closed down in 1879 under the assumption that they were exhausted. Many other pyrite deposits have been worked for gold, iron or copper at some time. The steady pyrite industry of the Province began in 1900 when ore from the Bannockburn mine was produced. Mines in Hastings County have been steady producers since that time. An acid-making plant has been in operation at Sulphide since 1907 by the Nicholls Chemical Co. for the treatment of its ore at Sulphide. The company also buys the ore mined from other properties in the neighborhood. Another plant for treating custom ore is operated by the Grasseli Chemical Co. at Hamilton. These two plants treat the bulk of Eastern Ontario production, the remainder being shipped to the United States.

Recently a large percentage of the production has been coming from the Vermilion Lake deposits in North-western Ontario, the ore being shipped to United States ports on the Great Lakes. Another property, the Goudreau Lake deposits, has been recently developed and expects to commence at once supplying large tonnages. The Helen mine, operated by the Algoma Steel Corporation, produces some pyrite which is treated in its plant at Sault Ste. Marie.

The iron pyrites resources of Ontario are of considerable extent and value, in the last 15 years 538,755 tons, worth $1,438,122, having been produced, the greater part coming from South-eastern Ontario. During the coming years there will undoubtedly be a steady increase in production. The war has had a stimulating effect on the demand of the United States for pyrite from Ontario.

**The Canadian Sulphur Ore Co.'s Pyrites Mine, No. 12** was discovered in 1906 by Stephen Wellington while prospecting for iron. Under the gossan, merchantable iron pyrites was discovered, from which a car load of iron pyrites was shipped in 1908. Later, the Canadian Pyrites Syndicate bought the property, installed a small plant and shipped a few hundred tons of pyrite. In the spring of 1910 the property was handed over to the present company, which began shipping ore three months later, and has continued to the present. The mine is equipped to produce 100 tons of iron pyrites per day, yielding 40 per cent. of sulphur. Since December 11, 1912, the mine has been run by electricity supplied by the Seymour Power Co. A branch line 2½ miles in length from the Bay of Quinte Railway near Queensboro to the mine was completed in 1913. The ore is shipepd to the Nicholls Chemical Co.'s acid plant at Sulphide, 11 miles south-east, and to the chemical companies at Hamilton and Detroit.

The pyrite is mined by underground and open-pit methods. The development work consists of three shafts and two open cuts, with some diamond-drill borings. Nos. 1 and 2 shafts, which are 75 and 100 ft. deep respectively, have been abandoned for some time. The work in late years has been confined to shaft No. 3 and the two open pits. The vertical shaft, No. 3, is 250 ft. deep with about 800 ft. of drifting on the 60-, 120-, and 200-ft. levels. The pyrite deposits are marked by gossan outcrops from 2 to 30 ft. in depth. Beneath are the pyrite deposits, which occur as lenses in contact with rusty schist to the south and white quartzite to the north (both Grenville in age) near an irregular post-Hastings intrusion of gray felsite. The strike of the deposits is slightly north of east, while the dip is almost vertical, inclining slightly to the south. Lenses vary in width up to 25 ft., but horses of country rock are frequently inclosed in the pyrites.

The ore is high grade, very little cobbing, if any, having to be done. Ores have been shipped running 40 to 48 per cent. sulphur.

The deposits are free from impurities such as arsenic, zinc, lead, copper and calcium. The pyrite burns satisfactorily, and is in good demand by sulphuric acid makers.

## INSPECTION OF WIRE ROPES.

At the mines of the Canadian Copper Co., according to Superintendent J. C. Nicholls, there is required a daily examination of the winding ropes, and of attachments to the drums and to the cages, skips and other means of conveyance, the brakes and depth indicators, and any safety catches attached thereto, and the pulley wheels and all and every external part of the winding arrangements upon which the safety of persons depend. At least once a month an examination is made of the structure of the winding rope, with a view of ascertaining the amount of deterioration thereof. For the purpose of this examination the rope must be cleansed at places selected by the mechanical engineer, who notes any reduction in the circumference of and the proportion of wear in the ropes.

At least once in six months the winding rope is recapped, a portion thereof, not less than seven (7) ft. in length, being at the same time cut off at the lower end. It is required that the portion of the rope so cut off shall have ends adequately fastened with binding wire to prevent disturbance of the strands. The wire is sent to a reputable testing laboratory and a certificate showing the result of testing is required.

At the periodical recapping of the winding rope, the connection between the rope and the cage, skips or other means of conveyance is annealed.

All new ropes purchased must be accompanied by a certificate from the manufacturer showing the amount of breaking load, as ascertained by actual test.

It is required that a winding rope newly put on and the connecting attachments between the rope and the cage, skips or other means of conveyance must be carefully examined by a mechanical engineer, and must not be used for the ordinary transport of persons in any shaft or winze until after two complete trips up and down the working portion of such shaft or winze, the cage, skip or others means of conveyance attached thereto bearing its authorized load.

In case of an overwind or skip or cage derailed, the ropes and all attachments are examined, and must not be used for raising or lowering persons until conveyance has been run at least two complete trips up and down the working portion of the shaft.

No winding rope for raising and lowering persons is used after examination has shown that the breaking load at any point therein has become reduced to less than six times the maximum working load. The maximum working load includes the weight of the rope in the shaft when the cage, skip or other means of conveyance is at the correct working point and the weight of such conveyance with its contained load.

## CANADIAN MINING INSTITUTE, WESTERN BRANCH

The adjourned meeting of the Western Branch of the Canadian Mining Institute was held at Sandon, Slocan, B.C., on Thursday evening, July 20. It was attended by leading mining men of Sandon and neighborhood and a number of visitors from other parts.

The branch secretary, Mr. E. Jacobs, before calling upon the newly elected chairman of the branch, Mr. Bruce White, manager for the Noonday Mines, Ltd., to preside, quoted from an address by Dr. Willet G. Miller, geologist for the Province of Ontario, a former president of the Institute as follows: The Canadian Mining Institute has covered a wide field. Its most important work, probably, has been that of the publication of papers. Few of these papers would have been written had the Institute not existed. Mining men are proverbially reluctant to appear in print, and their valuable experience is frequently lost. Local branches have much to do with getting papers. Men will prepare papers under local encouragement when they would pay little attention to written communications from the secretary of the Institute. . . . The mining men of Canada and their society, the Canadian Mining Institute, have a great mineral field before them—half a continent. We are scarcely at the beginning. Let us make the best use of our opportunities. Let us avail ourselves of the experience of older mining countries, have faith in Canada and a firm belief in the future of our industry."

Speaking of the difficulty usually experienced in inducing mining men to take an active part in meetings such as that then being held, the secretary mentioned that only last month he had read in a New York technical journal an editorial in which the following occurred: "No wonder the mining institutes do not build up and educate as they should. The operator too often thinks they should be abolished. There are too many such affairs, in his estimation, and they take up much time. The same might be said about the little red schoolhouse. It alsto takes both time and money. The institutes will be just what we make them. If we give them the cold shoulder, they will have only cold shoulder to feast on. If we give them hearty support and carefully control them so that none but speakers with a real story can take up the time of the institute, the associations will do worthy work.

Referring to their new chairman, Mr. Bruce White, the secretary said he was one of the older members of the Institute, having joined it in 1899, which was the year following its incorporation. Further, he was, as far as was known to the speaker, the only life member now resident in British Columbia. It was about a quarter of a century ago that Mr. White came to Slocan district, with the progress of which he had long been actively identified. He was too well known to residents in West Kootenay to need commendation or introduction to them. He well merited the honor recently done him in unanimously electing him chairman of the Western Branch of the Institute for the ensuing year. He had pleasure in now asking Mr. White to commence hs duties as chairman.

### Chairman's Address.

The chairman, in the course of a comprehensive address, first expressed the opinion that there is now being taken a greater general interest in the progress of the mining and metallurgical industries than was the case a few years ago. It is to be deplored, he said, that the largely increased demand for metals in the last two years has been the direct result of the destructive activities of war rather than of the constructive advances of a time of prosperous peace; on the other hand, it is a matter for congratulation that those engaged in the mining of ores and the extraction of useful metals, both throughout Canada and the republic to the south of us, have been equal to the emergency that has arisen and have to so large an extent met the enormous and urgent demand that was both unforseen and unexpected. While we do not find cause for pleasure in the fact that the big nations of Europe are at war, he remarked, it is permissible, I think I am justified in saying, to feel satisfaction in our having been in a position to do our part toward supplying the great need for metals that arose, and without the meeting of which Great Britain and her allies would have doubtless been under a tremendous disadvantage.

Quoting from a published report of a recent speech by the Hon. the Minister of Mines for British Columbia (Hon. Lorne A. Campbell), who had been a member of the Institute for nine years, as follows: "The old order has passed away and the mining centres of the Province are now coming into their own—this time under sure and safe auspices. There is no boom, but there is a great awakening of the industry which is bound to be permanent," Mr. White sad that it is gratifying and encouraging to find our energetic Minister of Mines convinced that the present condition of the mining industry warrants him in coming to such a conclusion, and he felt sure that all about him would share with him a sense of satisfaction that the prospects for the permanence of mining in British Columbia are believed to be good.

After quoting some editorial comment from the Nelson Daily News, to the effect that the mining industry of Kootenay and Boundary districts does not have to depend on abnormally high prices for its prosperity, it having been established on the basis of normal and not abnormal prices, and that it will continue to pay dividends after prices of metals shall have again become normal. Mr. White proceeded to review the progress of mining, taking in order the several minerals produced in the Province, and showing that the general situation at the end of the first half of the current year was satisfactory. He also made a brief survey of the advances made in metallurgical matters, and directed attention to the fact that after having for years produced much electrolytically refined lead at its works at Trail, the Consolidated Mining and Smelting Co. is now producing electrolytic zinc and is preparing to shortly add the electrolytic refining of copper to its operations. He concluded by expressing the hope that they will witness even greater progress as modern knowledge and practice shall be brought within their reach and that as a result of their efforts they will obtain a more adequate return for their labors than they had done in past years.

### Other Speakers.

Other addresses were delivered by Mr. Wm. Hunter, of Silverton, Slocan lake, who for years had represented Slocan district in the Provincial Legislature; Mr. John F. Sweeting, of the Canadian Pacific Railway Co.'s Natural Resources Department, Calgary, Alberta; Mr. E. L. Dewdney, manager of the Bank of Montreal, New Denver, B.C.; Mr. A. W. McCune, of Salt Lake City, Utah; and several others.

Professor Arthur Lakes, formerly of Denver, Colorado, but now resident in Nelson, B.C., read a paper on "The Relation of Igneous Rocks to Orebodies in British Columbia," and afterward replied to a number of questions that were put to him. A talk on "First-Aid and Mine-Rescue Training at Metal Mines" was made by Mr. H. H. Johnstone, of Rossland, district acting inspector of mines, and he also gave an interesting demonstration of the use of the triangular bandage in first-aid work.

The second night's session was largely devoted to reminiscences of early days in the Ainsworth and Slocan districts, after the day had been spent by some of the visitors at mines and concentrating mills in the neighborhood of Sandon. The proceedings were enlivened by instrumental and vocal music.

On July 29 a meeting was held at Silverton, in the vicinity of which are the Standard, Hewitt-Lorna Doone, Van-Roi and Galena Farm mines and concentrating mills, some of which were visited. The programme was largely a repetition of that submitted to the Sandon meeting, and it well maintained the interest of about fifty men from neighboring mines and towns who attended. A new feature was a talk by Mr. J. P. Keane, of the Rosebery concentrating mill, who took for his subject the oft-heard remark that "one man







**On the western prairies. A reminder of the geologists' excursions, 1913.**

can see as far into the ground as another," a view he did not agree with, and he showed that to be successful mining men must carefully acquire knowledge to fit them for their work.

## CALUMET AND HECLA.

Calumet and Hecla, the world's premier producer of native copper, has just celebrated its 50th anniversary with fitting ceremonies. The romance of its discovery and early struggles has been printed many times. but probably few people, not excepting the stockholders, have any conception of the amount of native pure copper which this spectacular producer has dug from the bowels of the earth during this eventful period.

The Boston News Bureau asked President Agassiz for figures summarizing in brief what Calumet and Hecla had produced during the past half century, what it had paid in dividends and what it had paid out in wages. The totals are quite beyond popular conception.

During the period in question it produced over two and a half billion pounds of copper, or to be exact, 2,686,896,000 pounds, or 26.868 pounds for every share of the company's present 100,000 shares outstanding.

The amount paid in dividends was $132,250.000, or $1,322 per share, assuming that the present capital was outstanding since the company's inception, which of course was not the case.

A striking fact is that notwithstanding the mine's bonanza profits, a sum almost equal to the dividend payments has been paid in wages to its miners. The wage item alone was $129,230,938, and this does not include eastern office and clerk hire costs, nor the indirect wage payments involved in huge purchases of materials, machinery and supplies.

The following summarizes the major items above referred to:

The amount paid in wages from December, 1867, to June 30, 1916, was..... $129,230,938
(This does not include eastern expenses)
The amount paid in dividends to June 30, 1916, is..... 132,250,000
There was produced from the starting of the mine to June 30, 1916, in pounds of copper..... 2,686,986,000

Production of C. & H. and subsidiary mines for the first half of 1916 was as follows:—

| | Production pounds. | Lbs. copper per ton ore. | Cost per pound. Cents. |
|---|---|---|---|
| Ahmeek | 11,461,195 | 21.24 | 9.59 |
| Allouez | 5,137,907 | 18.54 | 10.37 |
| Centennial | 1,269,697 | 16.42 | 12.89 |
| Isle Royale | 6,035,766 | 13.48 | 13.09 |
| Calumet & Hecla | 35,693,436 | 22.17 | 11.45 |
| Osceola | 9,791,439 | 15.72 | 10.12 |
| Superior | 1,758,465 | 17.22 | 12.89 |
| Tamarack | 3,446,425 | 18.48 | 14.67 |
| White Pine | 2,190,472 | 23.20 | 10.57 |
| Total | 76,784,802 | | |

## INTERNATIONAL NICKEL CO.

The International Nickel Co. will spend about $2,000,000 on the proposed new refinery which it will erect in Canada to produce all the nickel needed by Great Britain and her possessions. This expenditure will be met from treasury cash which approximates $8,500,000.

A subsidiary concern has been formed in Canada to own and operate the new plant and its $5.000,000 capital stock will be owned by the International Nickel Co.

Nickel prices have shown comparatively little advance beyond the normal level except where desired in the fine arts. On nickel sold for such requirements a premium has been demanded. At the present time the company's quotation range from 24 to 42 cents a pound according to specifications; where higher than normal prices, they do not exceed 5 per cent.

As the International Nickel management sizes up the situation, there will probably develop after the war a greater demand than now exists for its product. Shipyards all over the world have been straining every effort to get out new vessels. The construction of marine equipment promises to continue at a record breaking pace after peace has been established and this alone augurs well for the world's largest producer of nickel.

At the Copper Cliff mines there has been installed hoisting equipment capable of raising 4,000 tons of ore in eight hours. This, operated one shift a day, will more than care for the present milling and smelting requirements of about 3,500 tons daily and enable the company to build up a reserve in bins against the day when a greater tonnage will be needed.

The company's operations now result in an output of approximately 5,000,000 pounds of nickel and 3,000,000 lbs. of copper monthly or a total of 60,000,000 lbs. and 36,000,000 lbs. respectively per annum.

Some little misunderstanding having arisen in regard to the recent dividend declared it is officially stated that International Nickel may now be considered on a 24 per cent. dividend basis with possibilities of extras as earnings warrant.—Boston News Bureau.

## METAL PRICES.

Mr. Harry A. Guess, of New York, consulting engineer of the American Smelting and Refining Co., was reported to have said, when in Spokane, Washington, on August 16: "Copper appears to occupy a strong position in the metal market now that the allies have come forward with good buying orders, and there does not seem to be any likelihood of a serious decline in its price for a long time. The outlook for lead is generally felt to be more indefinite. While by no means weak, at present it is the least strong of all the metals, as it is the general belief that the Allied demand for copper for the manufacture of munitions will be accompanied in some degree by a demand for spelter, with the result that the price of zinc should be materially increased. My personal opinion is that with the return of peace and ordinary business conditions, spelter will experience a sharp decline to prices more nearly normal."

Articles of incorporation of the Jackson Basin Zinc Co., with an authorized capital of $2,000,000, were filed on July 6 at the office of the county auditor, Spokane, Washington, by Messrs. A. L. White, Chas. F. Caldwell, W. Yolen Williams, F. L. Kilner and Volney D. Williamson. The mining property to be acquired and operated by the company is situated in Jackson basin, about seven miles from Retallack (long known as Whitewater), on the Kaslo and Slocan railway west from Kootenay lake, British Columbia.

# PERSONAL AND GENERAL

Mr. J. B. Tyrrell has returned to Toronto from British Columbia. He spent some time at the Granby plants at Anyox.

Dr. W. G. Miller and Mr. T. F. Sutherland, who have been visiting the New Caledonia nickel mines for the Ontario Nickel Commission, reached Sydney on August 18 on their return from Noumea. They are expected to reach Toronto early in October.

Dr. A. P. Coleman, of the University of Toronto, is in Labrador, continuing investigations along the coast.

Dr. R. C. Wallace and Mr. Justin S. DeLury, of the University of Manitoba, have recently visited The Pas district and are now engaged in making reconnaisance surveys east of Lake Winnipeg for the Geological Survey of Canada.

Dr. A. Ledoux has been collecting mineral specimens in Ontario for the Bureau of Mines for exhibition purposes.

Mr. T. A. Rickard is visiting mining districts in British Columbia.

Geo. Watkin Evans, consulting mining engineer of Seattle, is East on a professional visit. He will shortly leave for Alaska on a two months' examination trip.

Mr. F. J. Longworth, of Greenwood, B.C., superintendent of the British Columbia Copper Co.'s smelting works there, paid a business visit to Colville, Washington, about the middle of August.

Mr. J. Cleveland Haas, of Spokane, Wash., consulting engineer to the Kootenay Development Co., was at the company's mining property near Ainsworth, B.C., for several days in August, investigating results of development work done.

Mr. James White, of Ottawa, assistant to the Chairman, and Deputy Head of the Commission of Conservation, was in Victoria, B.C., early in August. He was reported to have stated, in the course of an interview, that Mr. W. J. Dick, mining engineer to the Conservation Commission, is investigating the possibilities of the metal industries of Canada, with a view of substituting Canadian products in certain lines for those which have been formerly obtained in Germany, and for the manufacture of which Canada has an abundance of raw material.

Mr. Geo. A. Guess, professor of metallurgy at the University of Toronto, has been engaged to start the copper smelter of the Vermont Copper Co., at South Trafford, Vermont.

Mr. C. W. Harper, of Hackensack, N.J., went to Slocan City, B.C., last month to arrange for doing more development work on the Alice S. and Paterson mineral claims, situated about six miles from Slocan City.

Mr. W. S. Grether, of the mining staff of the Butte & Superior Mining Co., Butte, Montana, is superintending mining operations at the Hudson Bay zinc mine, near Salmo, Nelson mining division of British Columbia.

Mr. A. H. Gracey, formerly operating the Venus gold mine, near Nelson, B.C., is now at Kingman, Arizona.

Mr. R. D. Fetherstonhaugh, of Edmonton, Alberta, is stated to have bonded a group of mineral claims near Camborne, Fish Creek, Lardeau, B.C., after having visited the property about the end of July.

Mr. W. Yolen Williams, of Spokane, Washington, who in the nineties opened the Granby Consolidated Co.'s big copper mines in Boundary district of British Columbia, was examining mining properties in the western part of Ainsworth mining division and about Sandon in Slocan division about the end of July.

Mr. Bruce White, manager for the Noonday Mining Co., operating near Sandon, Slocan, B.C., was in the northern part of Washington State early in August, looking over a group of mineral claims there.

Mr. Anthony J. McMillan, liquidator of the Le Roi Mining Co., has returned to England after having spent several months in Eastern Canada and the United States.

Mr. A. J. Waddie, president and general manager of the Canadian Drawn Steel Co., Hamilton, was struck by a street car on August 22 and received severe injuries.

Mr. J. L. Bruce, of Butte, Montana, general manager for the Butte & Superior Mining Co., and for the Hudson Bay Mining Co., which is operating in Nelson mining division of British Columbia, is reported to have been operated on recently for appendicitis.

Mr. Harry A. Guess, of New York, consulting engineer for the American Smelting and Refining Co., and managing director of the Federal Mining and Smelting Co., arrived in Spokane, Washington, about the middle of August. The latter company operates mines and concentrating plant in the Coeur d'Alene district of Idaho, distant from Spokane only a few hours' journey.

Mr. Thomas Graham, of Victoria, B.C., chief inspector of mines for that Province, has been at Michel, Crow's Nest district, inquiring into the circumstances attending a fatal disaster that occurred there lately.

Mr. Joseph Hunter, of Victoria, B.C., chief engineer for the Canadian Collieries (Dunsmuir) Limited, operating the Comox and Extension collieries on Vancouver Island, has been taking a vacation at Banff, Alberta. The Victoria Daily Times on August 12 published a lengthy notice of Mr. Hunter's many activities and important engineering work during his residence of more than forty years in British Columbia, noting that he had given the greater part of his life to the development of that province.

Mr. Van H. Manning, of Washington, D.C., who has recently been visiting North-eastern Washington and the Coeur d'Alene district of the adjoining State of Idaho, has been banquetted in the City of Spokane, Washington, by prominent residents in and about the city, including many well-known mining men. Accompanying Mr. Manning were Messrs. F. G. Cottrell, G. A. Hulett, and Dorsey A. Lyon, all of the Bureau of Mines staff. Among those who accompanied the party to see mines and concentrating mills in the Coeur d'Alene district were Mr. Robert N. Bell, inspector of mines for the State of Idaho, and Mr. E. K. Soper, of Moscow ,Idaho, one of the professors in the mining engineering department of the University of Idaho.

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The next annual convention of the American Mining Congress will be held in Chicago in November of the current year. The secretary, Mr. James F .Callbreath, has already been attending to the preliminary arrangements, with the object of ensuring another large and successful gathering.

Anaconda Copper Co.'s production of copper in July of this year, according to the Butte correspondent of The Engineering and Mining Journal, was 28,200,000 lbs., this representing the output of the company's Washoe and Great Falls smelteries. This compares with 22,100,000 lbs. for July, 1915. The total of the company's production for the seven expired months of 1916 is 192,700,000 lbs., an average of 27,528,000 lbs. a month.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

Generally, the mining industry of British Columbia is in a progressive condition, with difficulties that restricted production for a short time overcome for the most part, and a prospect of mining and metallurgical operations being continued on a scale equal to that of the corresponding part of last year. Two recent dividend announcements were those of the Standard Silver-Lead Mining Co., of two and one-half cents a share on 2,000,000 shares, payable on September 9, and of the Rambler-Cariboo Mines, Ltd., of one cent a share, paid on August 15. The Standard Co.'s monthly profit disbursement of $50,000 brings the total for the current year up to $450,000; that of the Rambler-Cariboo, of $17,500, makes the total of that company for the expired part of 1916, $70,000.

It was reported before the middle of August that the coal-mine operators of the Crow's Nest district and their employees had agreed upon a basis of settlement of the war bonus payment question that had been the subject of negotiation for several weeks, and that the operators have made concessions that have found acceptance with the majority of the workers, who have returned to work.

### East Kootenay.

Production of ore at the Consolidated Co.'s Sullivan mine, near Kimberley, is again on a comparatively large scale, the larger compressor having been made safe for operating following renewal of foundations damaged by high water last June. The quantity of Sullivan ore received at Trail during the first week in August was 3,006 tons. The Trail News reported early in August that Mr. S. G. Blaylock, assistant general manager of the Consolidated Mining and Smelting Co., had returned to Trail from the Sullivan after having spent five weeks there looking after extensive repairs necessitated by recent floods.

The output of coal and coke from Crow's Nest collieries has been smaller lately owing to stoppage of work at some of the mines and coke ovens pending settlement of a wages question that was under consideration. Except that one mine at Michel, at which there was an explosion early in August, is not being worked, production is again nearly normal, so that the latter half of August will see the output back to normal quantity.

### West Kootenay.

**Ainsworth**—Silver-lead ore of good grade is being mined in a stope opened from a low-level adit driven in the Highland mine, but owing to inadequate hoisting facilities production is smaller than it might be under favorable conditions in this respect. It is stated that the galena coming from this part of the mine is the best known to occur on the property, which years ago was a comparatively large producer of lead ore. Development of the Krao-Crow Fledgling property, by Mr. A. W. McCune, of Salt Lake City, Utah, is in progress, the work of driving an adit to gain depth being well forward. This development is regarded as one of the more important undertakings in Ainsworth camp, its object being to open in the deep an ore-body that near the surface contained much native silver. As machine drills are being used, driving is rapid as compared with hand-drilling. Work is also being done on the Crescent group, on Coffee creek, where a vein of good lead-zinc ore has been opened to a depth of 35 ft., and an adit is being driven to develop this ore-shoot deeper than it has yet been worked. Air from the Florence Mining Co.'s new compressor, on Woodbury creek, was used on August 7 in the company's Hope mine, on Princess creek, for the first time. The compressor is a Canadian Ingersoll-Rand engine of 15-drill capacity; it is 20 by 18 on the low and 12 by 18 on the high side. The Kootenay Development Co. has commenced to drive a long adit from a level sufficiently high above the lake shore to allow room for the erection of a concentrating mill later should its provision be warranted by underground developments. This work is being done on the Early Bird claim of the company's group.

On several groups of claims on Woodbury creek small numbers of men are doing development work. Numerous mineral claims along one or other of the forks of this creek were located years ago, but, owing to there not being a wagon road to give better access to the country, development has been slow in recent years. As long ago as 1896, Mr. W. A. Carlyle, then Provincial Mineralogist, reported on a group of claims situated near where the creek flows into Kootenay Lake, two or three miles above Ainsworth, and gave brief particulars of a concentrating plant then being put in for the Canadian Pacific Mining and Milling Co of Minneapolis, but neither mining property nor mill has been worked in late years.

**Nelson**—Shipment of ore has been resumed by the Iron Mountain Co. from its Emerald lead mine, distant about eight miles from Salmo. No ore had been shipped prior to the first week in August since the snow went off the ground last spring; up to March 31 the total of this year's receipts of Emerald ore at the Trail smelting works was 436 tons. During several recent months the company's property was under bond to prospective purchasers, but as the bond was not taken up, Mr. John Waldbeser, manager of the Iron Mountain Co., arranged for ore production to again be undertaken, and now teams are hauling the ore to the railway at Salmo for shipment thence to Trail.

There has been an interruption to continued production of ore from the Queen gold mine, situated at the junction of Wolf and Sheep creeks, owing to the necessity having arisen for retimbering the main shaft throughout, which work has taken about six weeks. However, it is expected that before the end of August miners will again be stoping ore, of which a large body of a good average grade was opened on the 700-ft. level several months ago. Advantage has been taken of this opportunity to do some overhauling of the plant and machinery in the Queen 20-stamp mill.

Ore is being hauled down to the wagon road at the Queen mill from the Vancouver gold mine, situated between the Queen and Koothenay Belle properties. Dempster Bros., who are in charge of mining operations at the Vancouver, are opening the mine down to a lower level than that from which ore had been taken in the past, the intention being to block out a considerable quantity of ore before attempting to make provision for milling in the neighborhood of the mine.

Laib Bros., owners of the Spokane group, in the Bayonne country, situated eight to twelve miles east of Sheep Creek camp, are having ore packed out to the Mother Lode mill, on Sheep creek, for wagon-hauling

thence to Salmo and shipment to Trail by railway. Last autumn a test shipment of 10.75 tons to Trail gave a return of $2.40 gold and 48.5 oz. silver a ton and 71.2 per cent. lead. Assays of average samples have since given a higher return in gold, so it is hoped the ore now being sent out will prove to be of higher average value than that shipped in 1915. Costs are high, the charge from mine to the railway at Salmo being $35 a ton; however, the Messrs. Laib are determined to demonstrate that ore from the Bayonne country is of sufficiently high value to warrant the expenditure of money by the Provincial Government on road construction and they hope their enterprise will induce the Government to make an appropriation sufficient to pay the cost of constructing a snow road, if not an ordinary wagon road, to Kootenay Lake, distant about 25 miles, so as to provide an outlet for ore at a considerably lower freight charge than has to be paid under existing conditions.

Further development of the Molly molybdenite property, on Lost Creek, some 15 miles by wagon-road from Salmo, in the southern part of Nelson mining division, is being arranged for. Mr. J. R. Rutherford, formerly manager for the Sheep Creek Motherlode Mining Co., is to direct this work, in doing which he will employ about 15 men. It is stated that a short option of purchase has been taken on the property, from which ore was shipped to Denver, Colorado, two or three years ago for bulk tests, and which gave satisfactory results, but the breaking out of war in Europe prevented the successful conclusion of prior negotiations for the purchase of the property by New York men understood to be acting for German principals.

**Rossland**—July ore production totalled 28,235 tons, of which 16,259 tons was from the Consolidated Co.'s Centre Star-War Eagle group of mines, 10.543 tons from the same company's Le Roi mine, and 1.433 tons from the Le Roi No. 2 Company's Josie group. The Consolidated Company is prospecting the Deer Park property, in the South Belt region, doing both surface work and diamond drilling.

**Trail**—Ore receipts for the month of July totalled 40,268 tons, of which quantity 32,720 tons was from mines operated by the Consolidated Mining and Smelting Co., and 7,548 tons was of custom ores. The larger shippers were the company's Centre-Star-War Eagle and Le Roi mines at Rossland, together 26,802 tons, and its Sullivan mine, near Kimberley, East Kootenay, with 5,532 tons. Enlargement of the electrolytic zinc refinery, which the Consolidated Co. has been operating for several months, is being made; other advances are the construction and equipment of an electrolytic copper refinery, and the completion of provision for resuming the manufacture of fluosilicic acid for use in the electrolytic refining process.

**Trout Lake Division**—Among the ore receipts at Trail during the first week in August was that of 63 tons from the Silver Cup mine, near Ferguson. This was the first ore from that part of the district shipped to Trail this year. Efforts are being made to resume production at the Triune mine, and development work is being done on several other properties in the division, after a period of inactivity which had for some time been general in this region.

### General Notes.

Efforts are being made to induce the Provincial Government to construct a wagon road into what is known as the Burnt Basin district, between the Columbia river and Christina lake, starting from near Paulson on the railway from Nelson to Boundary district, the object being to give wagon-hauling communication to a number of mineral claims on which there are good showings of ore. One group, known as the Molly Gibson group, shipped ore to a smelting works some years ago, but the cost of getting it out to the railway was too great to allow of production being continued.

Ore is being hauled from the Aberdeen, near Mamette lake, in Nicola district, to the railway for transportation thence to the British Columbia Copper Co.'s smelting works at Greenwood, Boundary district.

It is stated that the Granby Consolidated M. S. and P. Co. is arranging to develop a group of copper claims near Kamloops, in Yale district. There has only been one shipper of copper ore in considerable quantity from a mine in that neighborhood in recent years, namely the Iron Mask, on Coal Hill.

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## DRILLING AT FLIN-FLON STOPPED.

The Pas, Man., Aug. 18.—The deal for the copper sulphide mines at Flin-Flon is temporarily held up pending a re-arrangement of the terms of payment, it is reported. The diamond drill operations have been suspended, and the engineers called to New York. That the ore is present in sufficient body to make one of the largest mines of its kind in Canada is not disputed by anyone connected with the property. The ore values blocked out by the drills is variously estimated at between thirty and sixty millions of dollars. The deal for the sale of the twelve claims in the group involved a sum of three millions of dollars, with a first payment of half a million on January 12th next. It is this large first payment and subsequent large instalments that is objected to by the buyers, and they want better terms. About $50,000 has been spent already on the properties, and a small initial payment was made at the outset on the total purchase price, and it is believed that the Boston interests are jockeying for the advantage. Mr. John Hammell represents the prospectors interested. The hitch is expected to be adjusted this month, and work will be resumed.

Of the deal the Winnipeg Telegram says:

"On the best authority it is definitely announced that the big American mining interests which have for the past six months been engaged in diamond drill at Flin-Flon lake, in The Pas mining district, have abandoned the project.

"An immense sulphide deposit, said to be extremely rich in copper, zinc and gold, situated at Flin-Flon lake, was the subject of their investigations. Some $50,000 is said to have been spent on the work, under an agreement with the prospectors who own the twelve claims in which the ore-body is situated. This agreement is said to have been in the form of an option, which, in the event of the option being taken up, would involve a purchase price of $3,000,000, with a payment on the first of January next of $500,000.

"About a month ago orders were received by the engineers in charge of the work at Flin-Flon to cease operations and come in. Drilling was promptly stopped, and the whole outfit pulled up stakes and returned to civilization. Since then rumor has been busy as to the reasons for this sudden cessation, the favorite solution being that operations would be resumed on the modification of the agreement. It is now learned that this is not to be the case, and that the operating interests are out of the deal for good.

"On the same authority it is stated that the withdrawal of the mining companies is not necessarily any reflection on the district itself, which is believed to have great promise as a mining camp of big calibre. Nor does it necessarily mean that the property under investigation has fallen short of the expectations of either of the parties to the deal. No reason whatever is offered for the irrevocable decision of withdrawal."

The Telegram's authority for saying the deal is off altogether is not clear. A letter was received in The Pas this week indicating that the parties had got together, and a satisfactory re-arrangement of the terms would be arrived at shortly. In fact, a local engineer has gone to Flin-Flon to make preparations for resumption of drilling at an early date.—The Pas Herald.

## THE FLIN-FLON DEAL.

The Pas, Man., Aug. 18.—A satisfactory solution of the differences between the financial interests back of the deal at Flin-Flon and the owners of the properties involved may be arrived at within a fortnight. Deals the size of this one are not common in mining, and it might be expected that some obstacle would arise between the parties interested to subject the deal to a re-arrangement. Three millions of dollars is a lot of money to pay for a surface-showing mine, and when it is considered that this sum was the least of the bargain, which covers water powers, railroad and milling machinery, it is not to be wondered that the buyers sought better terms of payment, which were harsh in view of the hugeness of the undertaking and the expenditures for equipment to be incurred. Hammell drove the bargain, and it is now evident he is a good little bargainer of undoubted merit. He recognized only the prospectors' interests and the men associated with him in the property, and he harnessed the buyers into as good a bargain as he thought possible to get. The buyers desire the product of the mine to pay the cost of purchase, but they want this consideration, to be the basis of the agreement under re-arrangement. This seems a reasonable proposition, and it is the usual method employed in buying mines of this size and promise. However, it is now assured that the hitch will be adjusted and work resumed shortly.—The Pas Herald.

## GENESEE.

At the annual meeting of the Genesee Mining Company, held in the executive offices of the company in Rochester this week, the following were elected to the board: President, R. H. Gorsline, president of the New York State Pipe Co.; Vice-President, C. F. Crandall, director Union Trust Co.; Secretary-Treasurer, Alexander Rusell, secretary Rochester and Lake Ontario Water Company; managing director, L. F. Steenman, Cobalt; director, C. D. Van Zandt. With the exception of Mr. Steenman, the directorate consists entirely of Rochester men.

The shaft at the property is now down 194 feet.

## ROAD TO FLIN-FLON.

The contract for building a waggon portage to Flin-Flon will be given out within a short time. The road begins near the mouth of the Sturgeon river and runs into Athapapuskow lake, a total distance of between 12 and 15 miles. Considerable corduroying will be done on the Athapapuskow side of the portage. The contract price is made on a basis of progress estimate.

Commissioner J. A. Campbell arranged the matter.

## BOSTON CREEK.

Niagara Falls, Ont., Aug. 21.—The Boston Creek Gold Mining Co., Ltd., with headquarters at Niagara Falls, Ont., who hold a large block of gold claims, at their first annual meeting appointed the following officers: Eugene M. Richardson, New York, president; William B. Albright, New York, vice-president; Henry D. Symmes, Niagara Falls, Ont., managing director; John P. Bickell, Toronto, and John K. Papassimakes, Boston Creek, Ont., directors.

## BOUNDARY, B.C., MINERAL CLAIMS BONDED.

A press despatch from Grand Forks, in Boundary district of British Columbia, dated August 16, gave the following information:

After negotiations extending over some weeks, an important mining deal has just ben put through here whereby the Seattle and Loyal Canadian groups of mineral claims, situated eight miles north of Grand Forks, have been bonded by Robert (Seattle) Clark and associates to interests backed by E. E. Martin, a prominent financier of San Francisco. In the negotiations, W. P. Hofsletter, of St. Maries, Idaho, represented the purchasers.

The consideration is $125 000, of which $5,000 is to be paid in six months, $10,000 in twelve months, and the balance within two years. The agreement stipulates for shipment from the property of 50 tons of ore daily, upon which ore there will be payable to the owners of the claims a royalty of 50 cents a ton, though this will apply on the purchase price.

The property is one of which little has been heard for more than a decade, though considerable money was expended on it in development work some fifteen years ago, and a small quantity of ore was shipped. It is situated near the railway up the valley of the north fork of Kettle river.

Men are already at work on the property, and John McKay, of Republic, Washington, is in charge. Shipments of ore are being made three times a week to the Granby Co.'s smelting works at Grand Forks, and arrangements are under way for installing a compressor plant in October, after which installation the output of ore will be greatly increased.

Another deal is now pending for the acquisition by the same interests of other mining properties in the district.

## SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| August 11 | 66¼ | 31 5/8 |
| " 12 | 66¼ | 31 11/16 |
| " 14 | 66⅝ | 31¾ |
| " 15 | 66⅝ | 31¾ |
| " 16 | 66½ | 31 11/16 |
| " 17 | 66¼ | 31 9/16 |
| " 18 | 65¾ | 31 9/16 |
| " 19 | 65¾ | 31 |
| " 21 | 66 | 31 9/16 |

# MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto.)

As of close August 23, 1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Altantic Steel | 55.00 | 62.25 |
| Atla. Cons. | 15.00 | 25.00 |
| Butte | 5.25 | 5.75 |
| Can. Car | 45.00 | 55.00 |
| Curtiss Aeroplane | 20.00 | 30.00 |
| Can. Copper | 1.62 | 1.75 |
| Cambria Steel | 82.00 | Bid. |
| Canada Cement | 60.12 | 60.50 |
| Con. Ariz. | 1.50 | 1.62 |
| Emma Copper | 52.12 | 57.00 |
| Howe Sound | 4.75 | 5.00 |
| International Petroleum | 10.50 | 10.63 |
| Inter. Nickel (new) | 245.00 | 250.00 |
| Kennecott Copper | 50.37 | 50.50 |
| Maxim Munitions | 6.25 | 6.50 |
| Midvale Steel | 64.37 | 64.63 |
| Marconi | 3.37 | 3.63 |
| Magma | 14.25 | 15.25 |
| Mother Lode | 31.50 | 32.00 |
| Steel of Canada | 58.00 | 60.00 |
| Tonopah Extension | 5.75 | 5.87 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex | .07⅞ | .08 |
| Dome Consolidated | .08 | .12 |
| Dome Extension | .34¾ | .35¼ |
| Dome Lake | .43½ | .44½ |
| Dome Mines | 25.50 | ... |
| Eldorado | ... | .00½ |
| Foley O'Brien | .55 | ... |
| Gold Reef | ... | .01½ |
| Hollinger | ... | .30 |
| Homestakes | .60 | .80 |
| Jupiter | .27½ | .28 |
| McIntyre | 1.35 | 1.37 |
| McIntyre Extension | .40 | .46 |
| Moneta | .15½ | .16 |
| Plenaurum | .50 | .70 |
| Porcupine Crown | .62 | .65 |
| Porcupine Imperial | .02¾ | .03¼ |
| Porcupine Tisdale | .01½ | .02 |
| Porcupine Vipond | .35 | .40 |
| Preston East Dome | .04½ | .04⅞ |
| New Ray | .52 | .53 |
| Teck Hughes | .38¾ | .39 |
| West Dome | .38¾ | .39 |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Bailey | .07¾ | .08 |
| Beaver | .39 | ... |
| Buffalo | .85 | 1.10 |
| Chambers Ferland | .18 | .19 |
| Coniagas | 4.75 | 5.00 |
| Crown Reserve | .41 | .42 |
| Foster | ... | .07¼ |
| Gifford | .06¼ | .07 |
| Gould | .00¼ | .00⅜ |
| Great Northern | .05 | .05¼ |
| Hargreaves | .03 | .03½ |
| Hudson Bay | 55.00 | 70.00 |
| Kerr Lake | 4.85 | 4.95 |
| La Rose | .61 | .65 |
| McKinley | .59½ | .60½ |
| Nipissing | 7.00 | 7.09 |
| Ophir | .07¾ | .08¼ |
| Peterson Lake | .22½ | .23 |
| Right of Way | .05½ | .06 |
| Seneca Superior | .26 | .30 |
| Shamrock Cons. | ... | .09 |
| Silver Leaf | .01⅞ | .02 |
| Temiskaming | .59½ | .60 |
| Trethewey | .17 | .19 |
| York Ontario | .01½ | .01⅝ |
| Wettlaufer | .11 | .15 |

## NEW YORK MARKETS.

August 21, 1916—Connellsville Coke—

Furnace, spot, $2.75 to $2.85.

Furnace, contract, $2.50.

Foundry, prompt, $3.25 to $3.50.

Foundry, contract, $3.25 to $3.50.

August 21, 1916—Straits tin, f.o.b., 38.50 cents.

Copper—

Prime Lake, nominal, 27.00 to 27.50 cents.

Electrolytic, nominal, 27.75 to 28.00 cents.

Casting, nominal, 24.87½ to 25.12½ cents.

Lead, Trust price, 6.50 cents.

Lead, outside, 6.75 cents.

Spelter, prompt western shipments, 9.67½ to 9.92½ cents.

Antimony—

Chinese and Japanese, 13.50 to 14.50 cents.

American, not offered.

Aluminum—nominal—

No. 1 Virgin 98.99 per cent., 58.00 to 60.00 cents.

Pure 98-00 per cent. remelt, 56.00 to 58.00 cents.

No. 12 alloy remelt, 45.00 to 47.00 cents.

Powdered aluminum, $1.00 to $1.15.

Metallic magnesium, 99 per cent. plus, $3.50 to $3.75.

Nickel, 45.00 to 50.00 cents.

Cadmium, nominal, $1.25 to $1.50.

Quicksilver, nominal, $72.00.

Platinum, nominal, $60.00.

Cobalt (metallic), $1.25.

Silver (official), 66 cents.

Metal Products.—Following base prices are all f.o.b. mill, but prices are purely nominal:

Sheet copper, hot rolled, 37.50 cents.

Sheet copper, cold rolled, 38.50 cents.

Copper wire, nominal, 32.00 cents.

Copper wire, nominal, October, 30.75 cents.

High sheet brass, 38.00 to 39.00 cents.

Seamless brass tubing, 44.00 to 45.00 cents.

Seamless copper tubing, 44.50 to 45.50 cents.

Brazed brass tubing, 45.50 to 46.50 cents.

Brass wire, 38.00 to 39.00 cents.

Brass rods, 38.00 to 39.00 cents.

Sheet zinc, f.o.b. smelter, 15.00 cents.

## TORONTO MARKETS.

Aug. 23—(Quotations from Canada Metal Co., Toronto)—

Spelter, 12½ cents per lb.

Lead, 8¾ cents per lb.

Tinn, 44 cents per lb.

Antimony, 18 cents per lb.

Copper, casting, 28½ cents per lb.

Electrolytic, 30 cents per lb.

Ingot brass, yellow, 17 cents; red, 20 cents per lb.

Aug. 23—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, $8.00 per ton.

Coal, bituminous, $5.50 per ton.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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## Canadian Miner's Buying Directory.—(Continued from page 14.)

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Standard Underground Cable Co., of Canada, Ltd.

## ALPHABETICAL INDEX TO ADVERTISERS


A
Allan Whyte & Co. ..... 2
American Zinc Lead & Smelting Co. ..... 10
Armstrong, Whitworth of Can., Ltd. ..... 16

B
Bath, Henry & Son ..... 13
Balback Smelting & Refining Co. 13
Beatty, Blackstock, Fasken, Cowan & Chadwick ..... 12
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd..... 4

C
Campbell & Deyell, Ltd. ..... 11
Canadian Copper Co..... 6
Canadian Explosives, Ltd. ..... 5
Can. Ingersoll-Rand Co., Ltd..... 1
Canadian Inspection & Testing Laboratories, Ltd. ..... 11
Canadian Laboratories, Ltd. ..... 11
Canada Metal Co. ..... 12
Cohen, S. W. ..... 11
Consolidated Mining & Smelting Co. ..... 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. ..... 13
Curtis's & Harvey .....
.....Outside Back Cover

D
Darling Bros., Ltd. ..... 16
Dept. of Finance..Outside back cover
Dept. of Mines, Canada.....
.....Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. ... 4
Dominion Coal Co., Ltd..... 9
Dominion Engineering & Inspection Co. ..... 11
Dorr Co. ..... 11
Dwight & Lloyd Sintering Co., Inc. 7

E
Escher, Wyss & Co. ..... 4

F
Ferrier, W. F. ..... 11
Fleck, Alex. ..... 9
Forbes, D. L. H. ..... 11
Fuller, A. S. & Co. ..... 12

H
Hassan, A. A. ..... 11
Hendrick Mfg. Co. ..... 6
Hersey, Milton Co., Ltd. ..... 11
Heys, Thomas & Son ..... 11
Hitchcock, C. H. ..... 11

I
Imperial Bank of Canada ..... 6
Industrial & Technical Press, Ltd. 3
International Molybdenum Co.... 16
International Nickel Co. ..... 6

J
Johnson, Matthey & Co. ..... 11
Jeffrey Mfg. Co. ..... 10

L
Ledoux & Co. ..... 11
Lymans, Ltd. ..... 6

M
Mines and Copper Handbook .... 3
Murphy, Chas. J. ..... 11
Mussens, Ltd..... 10

N
New Ontario Oil & Gas Co. ..... 9
Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

O
Ontario, Province of .....
..... .....Inside Back Cover

P
Pacific Coast Pipe Co., Ltd. .... 9

Q
Quebec, Province of ..... 8

S
School of Mining ..... 16
Segsworth, R. F. ..... 12
Smart-Turner Machine Co., Ltd... 9
Smith & Durkee Diamond Drill Co. ..... 12
Smith & Travers Diamond Drill Co. ..... 12
Smith, Sydney ..... 11
Spearman, Chas. ..... 11
Standard Underground Cable Co. of Can., Ltd. ..... 9
Sullivan Machinery Co. ..... 2
Summerhayes, Maurice W. ..... 11

T
Tyrrell, J. B. ..... 11

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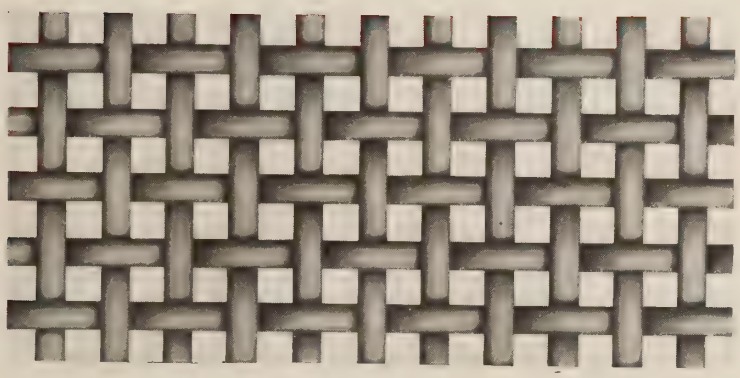
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## MINES BRANCH

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The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1913, by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

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Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

## GEOLOGICAL SURVEY

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Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.

Memoir 50. Upper White River District, Yukon, by D. D. Cairnes.

Memoir 56. Geology of Franklin Mining Camp, British Columbia, by C. W. Drysdale.

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 60. Arisaig-Antigonish District, Nova Scotia, by M. Y. Williams.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

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Memoir 68. A Geological Reconnaissance Between Golden and Kamloops, B.C., along the Canadian Pacific Railway, by R. A. Daly.

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Memoir 79. Ore Deposits of the Beaverdell Map-area, by L. Reinecke.

Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

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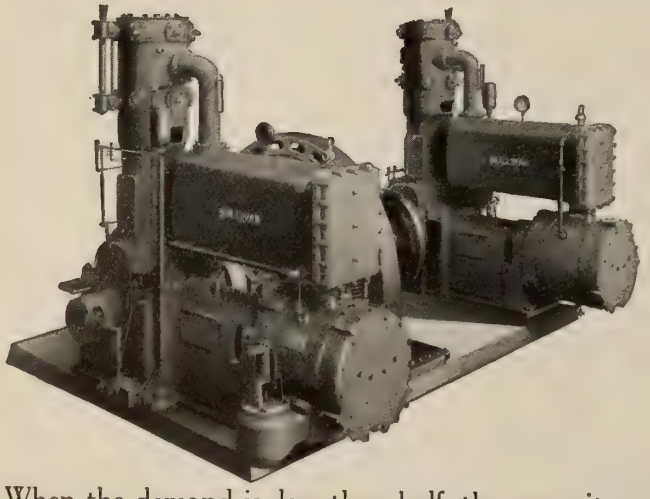
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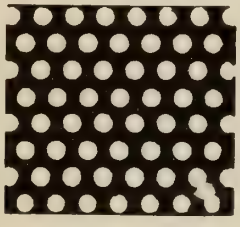
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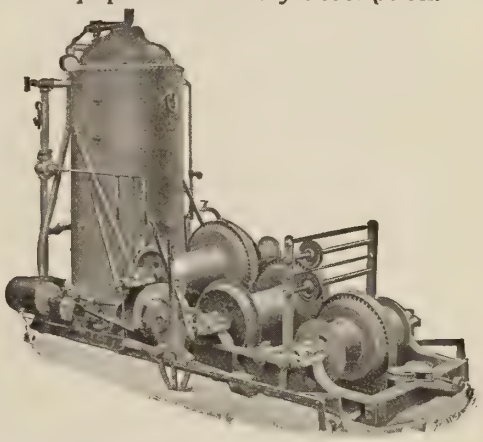
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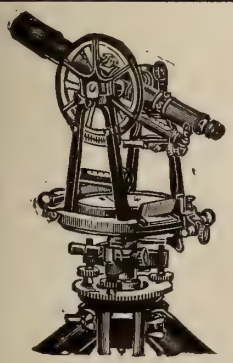
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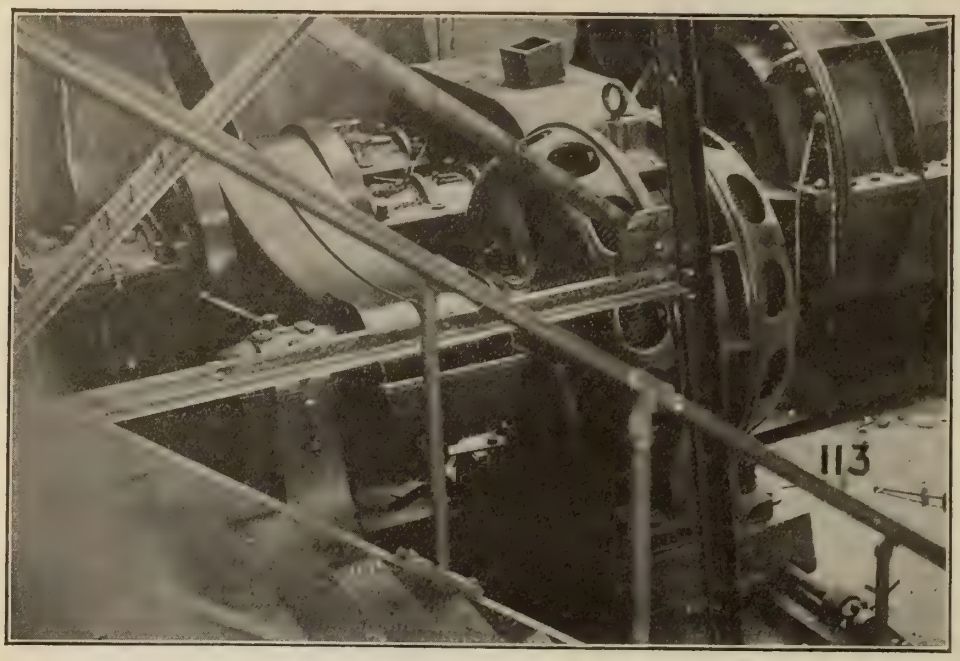
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The plate was exposed fifty seconds while the

## Renold Patent Silent Chain

was transmitting 200 H.P. at 1320 feet per minute.

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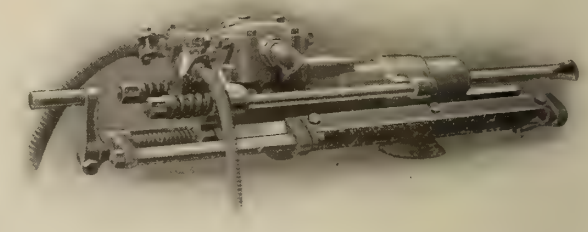
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, September 15, 1916. No. 18

## The Canadian Mining Journal

With which is incorporated the
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CONTENTS

| | Page. |
|---|---|
| Editorials— | |
| Why the Fiction? | 431 |
| Trading with the Enemy | 431 |
| The Increase in Nickel Production | 432 |
| United States Consumption of Nickel | 432 |
| United States Imports of nickel | 432 |
| Location of the Nickel Refinery | 432 |
| Correspondence— | |
| The Composition of Natural Gas | 433 |
| The Coal Dust Problem | 433 |
| The Thetford Strike | 436 |
| Mineral Resources of Newfoundland. By P. W. Browne. | 437 |
| Newfoundland Coal Deposits. By J. W. McGrath | 439 |
| The Lake Superior Corporation | 442 |
| Wages at Rossland and Trail | 443 |
| The Sullivan Mine, B.C. | 444 |
| The Development of Manitoba's Mineral Resources. By Hay Stead | 446 |
| Personal and General | 449 |
| Special Correspondence | 450 |
| Markets | 454 |

## WHY THE FICTION?

The Department of Trade and Commerce, Ottawa, reports that during the year ended March 31, 1916, there was exported to the United Kingdom nickel ore, matte, etc., containing 11,610,100 lbs. nickel, valued at $1,779,801. What is the object in publishing such estimates of value? Is it not known that the figure is ridiculous? If the Department of Trade and Commerce does not know what nickel matte is worth why does it not make an effort to find out? Why does it publish figures which a reader might infer to be correct to the last dollar, when, as a matter of fact, even the number of millions of dollars is not given correctly?

The U. S. Department of Commerce, Washington, in reporting the imports and exports of nickel during 1915, estmates the value of the nickel in the matte at 13.5 cents per pound and the value of the refined nickel at 38 cents, thus giving the confident reader the idea that the 26,418,550 lbs. of nickel exported to Europe was worth $10,038,514, while the matte imported from Canada, containing 56,352,582 lbs. of nickel, was worth only $7,615,999. The U. S. officials are evidently as well informed as our own.

Why should Canadian officials seek to minimize the value of our exports? Do they do so knowingly, or do they publish figures which are to be taken as the result of dictation rather than investigation? Who is the dictator?

## TRADING WITH THE ENEMY

The blacklisting of firms controlled by Germans and doing business in neutral countries has naturally aroused considerable criticism, some of those firms listed claiming that they have been unjustly treated. The blacklist is also criticised by some who are not themselves affected, but who regard it as unjust discrimination against citizents of their country. How much of the opposition arises from pro-German propaganda and how much from the more considered judgment of friendly or neutral Americans we are unable to judge. We can only hope that the British and American governments will find time to give it the consideration that the problem deserves.

But there is a phase of this question that more directly affects Canadians, and among them Canadian mining men. How many Canadian companies are trading with houses which are controlled by firms that are on the British blacklist? Why are they doing so? Why does the Canadian Government not advise them that they should not do so?

It is no secret that such business is being carried on. There has been, unfortunately, no attempt to stop it.

Why not? Is it because we depend so much on the British Government that we are slow to take necessary measures ourselves? Is it fair to the Empire or to ourselves to allow traffic with friends of the enemy to be carried on under our noses until the overworked British officials find time to stop it?

## NICKEL PRODUCTION INCREASING

It is reported from New York that the International Nickel Company produced in the month of August 7,600,000 pounds of nickel. This is a great increase over any previous month.

During the year ending June 30, 1916, Canada exported to the United States 52,742 tons nickel-copper matte containing 64,622,286 pounds nickel, and worth about $16,000,000. The value given in government records is $8,596,921.

During the same period Canada exported a large quantity of nickel-copper matte to Wales. Figures are not yet available, but the nickel contents of matte shipped to both countries will total about 76,000,000 lbs., worth about $19,000,000. In addition, the matte contained copper worth in the matte probably $5,000,000. In other words, there was shipped during the year ended June 30, 1916, from the smelters in Ontario, matte worth about $24,000,000. The metals in the matte when refined would be worth about $40,000,000.

## U. S. CONSUMPTION OF NICKEL

In the year ending June 30th, 1916, the United States imported 56,987 tons ore and matte, containing 68,797,238 lbs. nickel. Of this 52,742 tons, containing 64,622,286 lbs. of nickel was from Canada, nearly if not all in the form of matte from the Canadian Copper Company's smelter at Copper Cliff, Ontario.

In the same year the United States exported 25,649,995 lbs. of nickel, nickel oxide and matte, nearly all of it being from the Ontario matte refined in New Jersey.

The U. S. Department of Commerce estimates the value of the 68,797,238 lbs. of nickel in the matte imported at $9,520,750, and the value of the 25,649,995 lbs. of nickel exported at $9,876,403.

The figures show that during the past year much less than one-half of the nickel imported was exported as nickel. Most of the nickel was, doubtless, used in the manufacture of nickel steel, of which a considerable part was exported. A further very large part was used in the United States. The figures showing the consumption of nickel steel are not yet available.

In view of the prominence given to consumption of nickel by Germany, it is interesting to note that the difference between U.S. imports and exports of nickel in the one year ending June 30, 1916, was greater than that of Germany for the period of fifteen years immediately preceding the war. As a market for Canadian nickel, the United States has no peer.

### U. S. IMPORTS OF NICKEL IN 1915.

The Bureau of Foreign and Domestic Commerce, Washington, reports imports of nickel in 1913, 1914 and 1915 as follows:—

| | | |
|---|---|---|
| 1913—Nickel ore and matte | | 4,745 tons |
| | Nickel contents | 47,194,101 lbs. |
| | Value | $6,427,639 |
| 1914—Nickel ore and matte | | 29,564 tons. |
| | Nickel contents | 35,006,770 lbs. |
| | Value | $4,956,448 |
| 1915—Nickel ore and matte | | 45,798 tons. |
| | Nickel contents | 56,352,582 lbs. |
| | Value | $7,615,999 |

We have no reason to doubt the accuracy of the Bureau's figures in so far as they refer to quantity of nickel. The Bureau's estimate of value is, however, away off. 56,362,582 lbs. of nickel in matte would be worth at least $14,000,000. Most of the nickel imported was contained in matte from the Canadian Copper Company's smelter at Copper Cliff, Ont.

Exports of nickel, nickel oxide and matte from the U. S. were as follows: 1913, 29,173,088 lbs.; 1914, 27,595,152 lbs.; 1915, 26,418,550 lbs. Thus while output of Canadian nickel has greatly increased, there has thus been little change in the amount of nickel exported from the United States. The records of export of nickel steel manufacturers would tell an interesting story.

### LOCATION OF THE NICKEL REFINERY.

It is announced that the International Nickel Co. is to begin the construction of a nickel refinery at Port Colborne, a site which is, as has been pointed out by Major R. W. Leonard, within long range gun fire of the international boundary. The site has many advantages; but it is strange that such a location has been permitted. The United States is rightly regarded by Canadians as a very friendly country; but that is no sufficient reason for establishing such an industry where it could be promptly wrecked at a time when most needed.

The war is being carried on at tremendous cost of life and money. Are we not even to profit by the lessons it has taught?

### A CORRECTION.

In commenting on the composition of natural gas we referred to the fact that Bulletin 42, U. S. Bureau of Mines, gives a number of analyses nearly all of which show ethane. By a typographical error "ethane" was printed "methane" on page 386 of our August 15 issue, thus nullifying earlier statements in the same paragraph.

### MOLYBDENUM.

The International Molybdenum Company has established at Renfrew, with a capacity of 100 tons per day. The company issues each month a list showing price paid per unit of molybdenite on different grades of ore. These prices will be quoted in The Canadian Mining Journal.

## CORRESPONDENCE

### THE COMPOSITION OF NATURAL GAS.

To the Editor of The Canadian Mining Journal, Toronto:

Sir,—I note your editorial in reference to my letter in Coal Age, and as my object is to obtain information I will ask you (1) to define the composition of natural dry gas; (2) the composition of wet gas; (3) the composition of the gas given off by heated crude oil; and (4) whether you consider that natural gas results from crude oil in the earth's crust, or from some other source; and lastly if the latter, then from what source it is created?

Yours, etc.,

JAMES ASHWORTH.

921 Drake St., Vancouver, B.C.,
Aug. 29, 1916.

In reply to Mr. Ashworth's several questions we have to say that it is clearly impossible to "define the composition of natural 'dry' gas," as it is neither a definite chemical compound as, for instance, water, nor a mechanical mixture of different elements in constant proportions like the atmosphere. It consists of a mixture of several different gases in very widely varying percentages. Thus some reliable analyses are published showing practically no nitrogen, while on the other hand there is one instance on record of a natural gas containing 98 per cent. nitrogen. Part of the Kansas field, for example, yields a gas containing over 40 per cent. nitrogen, and there is no doubt if our information were more complete we would have instances of every per cent. of nitrogen between 0 and 100. Natural gases containing over 80 per cent. nitrogen are incombustible and of no commercial value. With the other constituents there are also great variations. Sometimes methane is present to over 99 per cent. in amount. In the list of analyses given of Ontario dry natural gases (XXIII Report, Bureau of Mines) the lowest methane is 67.8 per cent. and the highest 93.7 per cent. Ethane varies from 3.3 to 18.0 per cent., propane from 0 to 3.5, nitrogen from 2.8 to 15.8, while fractions of a per cent. or carbon dioxide and hydrogen sulphide appear in some cases. Of course a scrutiny of other lists of analyses would extend all these limits given above.

The same thing applies to "wet" gas—it is impossible to define its composition. In general we may say that the higher members of the paraffin series, such as ethane, propane and butane, which do not appear to exist in "dry" gas in large quantities, are increased at the expense of the methane.

With regard to the composition of the gas given off by heated crude oil, it may be stated that in the manufacture of carburetted water gas in which gas oil is used the average composition of the product is approximately as follows: Carbon dioxide 2.9, heavy hydrocarbons or olefines or illuminants 7.5, oxygen 0.2, carbon monoxide 32.5, methane 13.7, hydrogen 36.2 and nitrogen 7.0. If there had not been any oil used in making the carburetted water gas the result would have been about half hydrogen and half carbon monoxide with a small amount of nitrogen, oxygen, etc. It is seen then that the effect of the oil is apparently to introduce heavy hydrocarbons and methane. Heavy hydrocarbons, it may be remarked, are not found in natural gas. Gas oil is crude oil from which the more volatile constituents have been distilled.

Mr. Ashworth's fourth question as to the origin of natural gas we must confess we are unable to answer. It would take immense space to discuss this. In the volumes of the Canadian Mining Institute will be found very interesting papers and discussions on this subject by Mr. Eugene Coste. It does not appear to us that any progress will be made in solving this question, as long as people are content to propound or accept some theory as to the origin of gas and neglect to find out what it is in our power to ascertain definitely, as for instance the correct composition of natural gas. It is for this reason that we will continue to protest against the acceptance and endless repetition of statements that are now known to be incorrect, such as were contained in the report which we criticized and which Mr. Ashworth defends.

---

## THE COAL DUST PROBLEM

Editor Canadian Mining Journal, Toronto:

Sir,—Referring to Mr. Jas. Ashworth's notes in your journal, Aug. 1, on the writer's paper on "Coal Dust" which was read at the meeting of the Rocky Mountain branch of the Canadian Mining Institute held at Lethbridge, Alta., in April, 1916, the writer heartily thanks Mr. Ashworth. His notes on the paper are very helpful, and it would have given the writer great pleasure to have had Mr. Ashworth take part in the discussion on the paper when it was presented at Lethbridge.

The writer will endeavor to reply to Mr. Ashworth's notes in the order in which they were presented in your esteemed journal of August 1, 1916.

1.—"Adopt the panel system." The writer did not think it was necessary to present any plans or diagrams on this part of the subject, as the panel system is well known and carried out to some extent in the mines of the Crow's Nest Pass. The advantages the writer claims for this method of work are the few inlets and outlets in each panel section, which assists very materially in isolating one panel section from another. There is a solid barrier of coal between each panel which is only perforated by the main and counter entries at the lower end, and there is also one inlet for the intake air and an outlet for the return air from each panel section. If any panel section becomes dusty with coal dust and it is not practicable to moisten the coal dust in the chutes below what is considered to be the point of explosibility, then it is, the writer considers, a decided advantage to be able to isolate such panel section by means of only three inert dust barriers, one on the outbye side of the intake airway off the main entry, one on the outbye side of the counter entry and another one on the upper side of the return airway from the panel section in question. By the above means inert dust barriers would be erected in all roadways leading from one panel section to another.

A mine may be divided into districts in accordance with the Mines Act, but that does not necessarily mean that each district would be a panel section. Separate districts have been and are arranged by simply installing an arrangement of stoppings between one district and another and splitting the air. Should an explosion occur the stoppings would not offer very much resistance to an explosive force, and consequently the explosion would penetrate to every part of the mine. Mr. Ashworth omitted to state whether any steps had been taken to prevent propagation of an explosion in the South Wales mine that had been divided into panels, also whether the panels were separated by means of solid barriers of coal between each panel or simply by means of stoppings.

2.—"Leave solid barriers of coal between lifts." This had special reference to pitching seams and means that a solid barrier of coal should be left between each lift on the pitch, for the purpose of keeping each lift separate from another and so prevent the possibility of an explosion spreading from one lift to another.

3. The writer was much pleased to find that Mr. Ashworth agreed with the idea of a dip entry being driven for the intake airway. The advantages of this method are generally conceded, and it is being carried out at some of the mines in the Crow's Nest Pass at the present time.

4.—"The enlarging of crosscuts between chutes." Mr. Ashworth is fully aware that most of the pitching coal seams in the Crow's Nest Pass range from 10 ft. to 15 ft. thick. The chutes, as a rule, are driven from 10 ft. to 14 ft. wide, and the full thickness of the seam thus giving an area of from 100 sq. ft. to 200 sq. ft. The crosscuts between the chutes are generally driven 6 ft. by 6 ft. to 8 ft. by 8 ft., giving areas of from 36 sq. ft. to 64 sq. ft. The writer claims that a volume of air from 25,000 cu. ft. per minute to 30,000 cu. ft. per minute is too large to put through areas of from 36 sq. ft. to 64 sq. ft.; the velocity of the air would be far too great for a dusty and gaseous mine. Such a velocity of air would raise and hold in suspension the coal dust and convey it to other parts of the mine, and where the air is carrying a fairly high percentage of methane would cause a very dangerous condition which should be avoided at all costs.

The writer fails to understand where the cost of making the area of the crosscuts equal to the area of the chutes and the building and maintenance of the stoppings would be prohibitive. It means that a few more tons of coal would have to be taken out of the crosscuts, a little increase of stopping material and a little longer time to build the stopping. Where the above extra cost is entailed in an effort to save life and property it would not be considered.

We require in the mines of the Crow's Nest Pass large airways and large and slow-moving volumes of air.

6.—"Do not allow the removal of large bodies of gas during the time the majority of the workmen are in the mine, whether or not the mine be dry and dusty." The writer fails to understand that the provisions of the Mines Regulation Act, General Rule 8, B.C., does cover this suggestion, as stated by Mr. Ashworth. This section of the Act does not prohibit the removal of bodies of gas during the time the majority of the workmen are in the mine. If there is a body of gas in any one working place in any section of a mine, that place would be fenced off; but there is not anything in the Act that prohibits that body of gas being removed during the time the majority of the workmen are in the mine—hence the writer's suggestion on this point. Even if the Mines Act did cover the above suggestion, which, in the writer's opinion, it does not, he fails to understand that there is any harm done in reminding mining men of the danger of such a practice.

7.—"The installation of a water spraying system or, where that is not possible, the installation of inert dust barriers in all roads leading from the dry and dusty section to other sections of the mine." Mr. Ashworth states that "the writer has shown in the body of his paper that this system is a positive impossibility in the icy cold mines in the Crow's Nest Pass at the time of the year when it is assumed that water in some form would be the most necessary." The writer does not hold himself responsible for the correctness or otherwise of Mr. Ashworth's construction of some parts of his paper. What the writer does say is that Mr. Ashworth is wrong in his assumption, as the writer is decidedly not of that opinion and certainly does not convey that meaning in the body of his paper. It is quite practicable and possible for the management of any mine in the Crow's Nest Pass to put in a water spraying system in the parts of the mines that are dusty with coal dust and operate them all the year round, especially in those mines that have adopted the dip entry and panel system. The main object of any spraying system is to moisten the coal dust adhering to the roof, floor and sides, chiefly in the chutes, below the point of explosibility. The temperature in these places, even in the very coldest weather, makes the water spraying system possible and practicable. The only objection to this system of spraying, in the writer's opinion, and one which Mr. Ashworth did not mention, is that the coal lying in the chutes is liable to become moistened or wet and when loaded into the mine cars and taken out of the mine would very likely freeze in the coal bunkers in the tipple. As the object of water spraying in mines that are dusty with coal dust is to protect life and property some plan would have to be devised to overcome the possible freezing of the wet coal in the bunkers. The writer also contends that if the coal dust in a coal mine is moistened below the point of explosibility it not only prevents the possibility of an explosion of coal dust, but it also prevents the suspension of coal dust in the air of the mine, and also from being carried by the air into other parts of the mine, especially where the mine air is carrying a high percentage of methane.

The writer fails to understand how the expressing of the relative humidity of the air entering and leaving these mines in percentages of humidity is misleading. It was the writer's intention to show in a short and striking manner the comparative amount of water carried out of the mines by the mine air in the winter time and the reason why the mines are more dry and dusty in the winter than in the spring and summer seasons. Without splitting hairs on this point it is generally known that the higher the temperature of the air the greater is its capacity to absorb or hold water, and that therefore if the temperature of the return air from any mine is high compared to the temperature of the intake air the amount of water carried out of the mine by the air is very great and the possibility of coal dust in the mine is certain.

For example, we will assume that 100,000 cu. ft. of air per minute enters a mine at a temperature of 35° Fahrenheit; the hygrometer shows a relative humidity of 50 per cent.; the amount of water carried into the mine by the air would be 2.026 gallons per minute, according to the tables given by the United States Bureau of Mines. Supposing the return air from the above intake showed a temperature of 55° Fahrenheit, taking Atkinson's formula the amount of air in the return would be 104,357 cu. ft. per minute; the hygrometer showed a relative humidity of 90 per cent.; the amount of water carried out of the mine would be 7.475 gallons per 100,000 cu. ft. of air. Deducting the amount of water carried into the mine by the intake air from the amount of water carried out of the mine by the return air the total amount of water carried out of the mine in 24 hours would be 8,188.416 gallons. The writer has not presented the above illustration for Mr. Ashworth's benefit, as he is already acquainted with it, but for the benefit of any reader who may be following up this subject.

The writer still maintains that inert dust barriers are designed and installed to try and prevent the propagation of an explosion of coal dust in a mine. He did not state in his paper that they will prevent the propagation of an explosion in any mine.

The writer does not agree with Mr. Ashworth's conclusion that "inert dust barriers" are so called preventatives against the extension of an explosion flame, from whatever cause it originates, and is designed to "make safe" the use of explosives in dusty, gaseous coal mines. The writer does not know of anyone making the above claim for "inert dust barriers," because anyone who would allow shot-firing in a gaseous, dusty mine, even though they used permitted explosives and were protected by inert dust barriers, would be guilty of a serious indiscretion and would expose the workmen and mine to very great danger.

The writer quite agrees with Mr. Ashworth that the gas commonly met with in the mines of the Crow's Nest Pass is not methane only. He has reason to believe that the gas often met with in these mines contains the mixtures mentioned by Mr. Ashworth. If that is the case that makes the conditions of the above mines more serious than he described in his paper.

The writer also heartily agrees with Mr. Ashworth's suggestions concerning main preventatives of explosions, except No. 3. He fails to see the particular danger of high pressure air pipes in these mines, as the parts of the mines in which they are generally installed are wet and almost invariably in the intake airway.

Yours, etc.,
W. SHAW,
District Inspector of Mines, Crow's Nest Pass and Pincher Creek Dist., Alberta.
Blairmore, Alberta, Sept. 4, 1916.

## NEWRAY.

Reports of the result of recent work at the Newray property, formerly known as the Rea mine and the Connell, indicate that an important discovery has been made. The Connell claim in 1910 appeared to have the makings of an important mine, the surface showing a strong vein carrying good values. A considerable quantity of gold, about $125,000, was taken from this vein, but development work was disappointing, the orebody proving unexpectedly small. It was thought that further development would prove the existence of more ore shoots, but the work done did not disclose any.

The reorganised company has been more successful in its prospecting work, and if half the statements made concerning the new finds are true the Newray will yet prove to be the mine that the Rea promised to be.

## KIRKLAND LAKE.

On the Kirkland Lake property, known as the McKane claim, important development work is being carried on. In crosscutting at the 300 ft. level a wide body of good ore was cut. Sinking is to be resumed to test this orebody at a lower depth. Mr. F. C. Culver regards the discovery as a most important one. If there is any considerable quantity of ore like that encountered at the 300 ft. level, the property will certainly be a very profitable one. Beaver Consolidated Mines has an option on the property, and it seems likely that the Beaver company has picked a good one.

## HOLLINGER.

Hollinger Consolidated Gold Mines, Ltd., reports for the four weeks ending August 11, 1916, gross profits of $220,357. Profits from operations Jan. 1 to Aug. 11 were $1,697,423.

During the four weeks ending Aug. 11 there was hoisted 43,387 tons ore. The mill treated 43,355 tons, averaging $9.61 per ton.

## NIPISSING.

During the month of August the Nipissing mined ore of an estimated value of $203,898, and shipped bullion from Nipissing and Customs ore of an estimated net value of $226,341. The production compares with $288,577 in July.

Development work on vein 490 at the fifth level was usually satisfactory. The vein in the north drift continued its course on the Nipissing side of the boundary line and also maintained its average width and assay. During most of the month two veins were in the face, having an aggregate width of six inches and assaying as high as 3,500 ounces and as low as a thousand ounces, the mean being about 2,200 ounces. At the end of the month the condition of the two veins continued to be satisfactory.

In the south drift results were good for the first part of the month, the veins aggregating 8 inches in width and assaying about a thousand ounces. During most of the month, however, the vein was too low grade to be treated. During this low grade period the vein has been from 8 to 21 inches wide. Drifting is still continuing. If no improvement in values is met with shortly, a raise will be started, partly for development and partly to obtain suitable ventilation on this level. After this has been attained, crosscutting and further development of vein 490 will be started. The ore shoot on this level is now over 400 ft. in length, with the north face still continuing satisfactory.

At shaft 80 most of the month's work was confined to exploration into hitherto undeveloped and favorable territory at the 315 and 380 ft. levels. This work is proceeding rapidly, but no veins have been encountered to date. At the 200 ft. level some tonnage was withdrawn from the old stopes and some active stoping was done on a branch vein.

At 81 shaft the Cobalt Lake fault was encountered at the 425 and 520 ft. levels, after crosscutting 159 and 232 ft. respectively. At both levels the condition of the fault is practically the same, it having a width of 12 in., contains some calcite, but assays only from four to six ounces in silver. Sixty-seven feet of drifting has since been done at the 425 ft. level and 50 ft. of drifting at the 520 ft. level, without any improvement in the condition of the vein.

At vein 102 some drifting was done at the 155 ft. level. Results from this work were not encouraging. The vein is now being further developed by two raises. Drifting has been started at the 90 ft. level, and better results are looked for. The vein at this level is small, but is usually of sufficient value to send to the low grade mill. A crosscut is also being driven at the 90 ft. level towards vein 96, which shows from one to two inches of ore assaying 2,000 ounces at the tunnel level.

About 90 tons of milling rock per day continue to be sent to the low grade mill from surface dumps at shafts 12, 86 and 127.

The high grade mill treated 152 tons and shipped 306,051 ounces of bullion.

The low grade mill treated 7,254 tons.

The following is an estimate of production for the month of August:

High grade, $112,065; low grade, $91,833; total, $203,898.—Northern Miner.

## THE THETFORD STRIKE.

The "Journal of Commerce," Montreal, says of the recent strike of employees of asbestos mining companies operating in Quebec::

"It is the general opinion here that the strike was a blunder from the start, as there appears to have been no dispute between the mine-owners and the main body of their employees on the question of wages, and the scale agreed upon in the conference of August 23 was the same which the employers had offered before the trouble, and which was to have gone into force on August 2nd. The whole trouble had its origin in a somewhat bitter rivalry between the local unions and a branch of the Western Federation of Miners recently started here.

"Previous to about a year ago the only labor organization in Thetford was a local one composed almost exclusively of French Catholics with the parish priest, the Rev. Father Proulx, as chaplain. Such a union could not very well include as members all the workers in the mines and an effort was made to organize those on the outside, with the result that a branch of the Western Federation of Miners was established. Within a short time thereafter the mine-owners made some adjustment in the rates paid to cobbers resulting in an increase in the wages of the female workers. The new branch of the International Union took to themselves the whole of the credit for this increase and used it for all it was worth to increase their membership. Early in 1916 the local French Catholic union asked for an increase in the wages of all the miners, which request was readily granted by the mine-owners, and the new scale went into effect on the first of last April. This gave the local union a prestige superior to that created by the claims of the International and the latter, not to be outdone, demanded a further advance of fifty cents a day and a recognition of their union by the mine-owners. The owners ignored these demands, but arranged to put into force on August 2nd a new scale of wages, comprehending a further increase of twenty-five cents a day, which was accepted by the French Catholic union.

"On August 2nd the members of the International struck and to avoid trouble which might result in injury to life and property, the members of the local union were advised to quit until the matter was settled and the mines and mills were consequently closed down. The strikers at once appealed to the Labor Department at Ottawa; but were advised that under section 56 of the Industrial Disputes Investigation Act it was illegal for any employee to go on strike "prior to or during a reference to a Board of Conciliation and Investigation,' and that if they desired a recourse to this legislation they would have to go back to work and make application in the regular manner. It was further pointed out to them that their strike was illegal.

"From all accounts this was not the only obstacle the strikers encountered as a result of their hasty action. Their rank and file had been advised that they would not suffer during the strike as they would receive a substantial weekly allowance from the head office of their union as strike pay. But instead of a remittance they were told that they were not entitled to and would not receive such assistance since they did not first obtain the consent of the strike committee of their union.

"They were thus in a hopeless position. They could not go back to work and apply for a Board of Conciliation and investigation under the provisions of the Industrial Disputes Investigation Act. They were not receiving strike pay, and every day they remained on strike they were liable to a heavy fine. As a result, many of their members left Thetford and sought work elsewhere.

"The leaders were very much chagrined and disappointed, and to prevent violence, restore peace and bring about a settlement the Governor-General in Council, under the provisions of the Inquiries Act R. S. C., Chapter 104 and Amendment 2 George V. chapter 28, appointed a Royal Commission in the person of C. E. A. Blanchet, barrister of Ottawa. Much credit is due to this gentleman, whose wisdom, good judgment and tact maintained the peace, secured the co-operation of all interested parties and brought about a satisfactory settlement without a single act of violence being committed or a dollar's worth of propety destroyed. It is a splendid example of how much of the efficiency of any of our laws lies in the tactful administration of them.

"After being closed down for three weeks, all the mines here resumed operation on August 24, as a result of the settlement arrived at in a conference between Mr. C. A. E. Blanchet, Royal Commissioner appointed by the Governor-General in Council, Mr. J. A. Lane, advocate from Quebec City, representing the mine owners, and two representatives from the employees of each of the following mines:: Asbestos Corporation of Canada, Limited; Bells Asbestos Mines; Jacob's Asbestos Manufacturing Company; Johnston's Asbestos Company; Martin-Bennett Asbestos Mines.

## SPOKANE EXCURSION TO WEST KOOTENAY, B.C.

Announcement was made in Spokane, Washington, on August 29, to the effect that the excursion to Nelson, British Columbia, which the Spokane Mining Men's Club has long planned to take place this autumn, has been arranged for September 29 to October 2. It is intended to leave Spokane on the morning of Friday, September 29, going by the Spokane International Railday to Yakh, B.C., on the Canadian Pacific Railway Co.'s Crowsnest line, and thence westward to Nelson, via Kootenay Landing. The return to Spokane will be made on October 2, by the Great Northern Railway Co.'s Spokane Falls and Northern railway south from Nelson via Northport to Spokane.

A joint meeting of the Spokane and Nelson Mining Men's Clubs will be held in Nelson. It is planned to afterward visit a number of mines near Nelson and in Ainsworth and Slocan districts. When at Northport on the way back to Spokane, a call will be made at the lead-smelting works there.

It was suggested that the Columbia (Spokane) Section of the American Institute of Mining Engineers and the Western Branch of the Canadian Mining Institute, should also meet at Nelson at the same time as the Mining Men's Clubs, but there is little likelihood of the latter falling in with such an arrangement, its autumn meeting having already been decided upon to be held at Trail and Rossland about the second or third week in October.

# MINERAL RESOURCES OF NEWFOUNDLAND

By P. W. Browne.

The recent discovery of copper in Little Bay by Mr. W. A. McKay has caused a sensation in local mining circles; and it will have a stimulating effect on the mining industry generally. Mr. McKay has just uncovered what promises to be one of the richest copper deposits in the country. Cross trenching to date shows a lode 300 ft. in width. The ore is chalcopyrite, and there is evidently a large body of it. An assay made by Mr. Davies, the Government Analyist, gives $4.80 per ton of gold.

The McKay Company has started operations on the lode; and fifty men are already employed. The location of the mine is but 500 ft. from the waterside, with splendid shipping facilities. A large stream in the rear will provide the necessary power for operations; and a 200-ton concentrator will be installed presently.

This great find is near the location of the "Old Mine" at Little Bay, where operations went on from 1878 to the late 90's, when they were abandoned owing to the high cost of production. At least this was the plea set up by the manager. The "Trade Review" discussing the mining industry some days ago says, however: "There is no doubt in our mind that anyone who seeks for the prime cause in the abandonment of some of our good copper deposits will find it in the fact that they were in charge of representatives of capitalists who were working on salary, and they did not care whether 'they killed the goose that laid the golden egg' as long as they themselves had enough to live on and could get out of the country."

Time was when Newfoundland was rated among the five great copper producing countries of the world, but within recent years the copper industry has been almost a negligible quantity in our industrial activities.

Copper mining in Newfoundland began in 1864 at Tilt Cove, a small fishing village in Notre Dame Bay; and during the following fifteen years we exported copper ore to the value of $1,572,154, and nickel ore worth $32,740. For nearly half a century the output of the Tilt Cove Mine averaged about 50,000 tons of ore annually. Then there came the dwindling process. At present writing there is an indication of a revival of operations; and some 250 men are at work there. A concentration plant with a capacity of 200 tons daily is now being installed.

In 1875 another copper mine was opened at Bett's Cove, about twelve miles south of Tilt Cove. In four years the quantity of ore exported amounted to 122,556 tons, valued at $2,982,863; and a St. John's journal makes the statement that Mr. Ellershausen, the lessee, is said to have made a scoop of $300,000 in one year's operations. Bett's Cove, so old miners have informed the writer, was literally "bled to death."

In 1878 a very rich deposit was discovered at Little Bay, some miles to the south-west of Bett's Cove; and was worked very successfully till the late 90's. It is in this region—some 1,000 feet north of the "Old Mine"—that Mr. McKay has made the big find.

### Copper Production of Newfoundland.

It is estimated that these mines, during the years they were in operation, yielded $20,000,000 worth of copper. Mr. Howley, Director of the Geological Survey, states: "Altogether the statistics of our copper mining up to date (1910) give a total output of 1,319,594 tons of ore, 78,015 tons of regulus, and 5,418 tons of ingot copper. The percentages of metallic copper contained in these ores have varied considerably, running from 3 to 30 per cent. I cannot obtain an average, but taking it at about 10 per cent. the total yield should be in the vicinity of 140,000 tons of metallic copper."

Many deposits of copper have been found in Notre Dame Bay, on which spasmodic attempts at mining have been made, which are known to be promising propositions if there were people with sufficient capital and competency to develop them. Newfoundland has been unfortunately too often victimized by impecunious speculators, who secure claims without ever being able to develop them. Then we have had the conscienceless "expert" who has played the flimflam game so frequently that foreign investors have been fighting shy of mineral properties, fearing to meet the financial fate of the shareholders of the celebrated Workington Mine, where a manager had undertaken to "serve a rabbit pie without having first caught the rabbit."

Within easy radius of Little Bay (which is now looming so large in local mining circles) are some very good copper properties, "Burton's Pond," "Southwest Arm," "Rabbitt's Arm," "Sunday Cove Island," and "Seal Bay." Some good showings have been located further south, in Bonavista, Trinity and Conception Bays; but the great metalliferous zone of the colony is undoubtedly Notre Dame Bay. Here we find an extensive development of the Lauzon series in which serpentines are predominant. The Geological Survey (very incomplete, unfortunately) estimates the serpentines: Between Hare and Pistolet Bays, 230 square miles; north from Bonne Bay, 350; south from Hare Bay, 175; south from Bonne Bay, 150; south from Bay of Islands, 182; surrounding Notre Dame Bay and Gander Lake region, 3,700; Bay d'Est, 300 square miles.

These, however, must be regarded only as approximations, for Newfoundland has never had within recent years an organized geological survey. We have been treated to annual feasts of theories; but we have not, except in certain specific instances, got beyond the stage of the "likely" and the "possibly."

We have reaped rich harvests from our copper mines, it is true; but we have done little to protect them from the grasping proclivities of vandalistic speculators.

### Iron Ore.

Our chief mineral product during the decade is hematite iron, which exists in seemingly inexhaustible quantities at Bell Island, in Conception Bay, some ten miles from St. John's. The Dominion Iron and Steel and the Scotia Companies are operating extensively at Wabana, as the mining section is known. The Scotia began mining there in 1895, and in 1899 it sold part of its area to the Dominion Company for $1,000,000. Both companies are operating now at full capacity, and the output for the year will, it is estimated, total 1,500,000 tons. The chief desideratum on the island at the moment is labor, which is likely to be abundant for the next three or four months owing to the shortage in the fisheries. During the fishing season it is difficult to secure the requisite supply of miners, as the returns from the fishery are usually more profitable than the wage offered by the mining companies.

Other iron properties exist in Conception Bay, at "Snow's Pond" and "Lower Island Cove," outcrops evidently of the Bell Island formation. It is rumored

that an American company will shortly undertake operations at Snow's Pond.

**The Bell Island Iron Mines.**

The famous deposit at Bell Island was discovered some twenty years ago more by accident than by design. It is regarded as one of the greatest iron properties known; and a former manager of the Steel plant in Sydney stated that "at the Bell Island mines the actual price of mining and putting the ore on the cars is less than the traditional contractor's price for the removal of earth; it is capable of being mined as cheap as dirt, and in making steel at Sydney the cost of freight on the assemblage of the raw materials there being: coal, nothing, as the smelters are built over coal beds; limestone, fifteen cents a ton; and ore, forty cents a ton—or fifty-five cents in all; the cost of assemblage is the lowest in the world, and represents a saving of $2.45 a ton over the assemblage cost in Pittsburg, Pennsylvania."

Of course this statement was made whilst the iron was being worked on the surface; but the cost has increased very largely since then. Freights have advanced; labor is more costly, and the working of the submarine areas involves a large outlay in transportation to the shipping points. These are located about a mile distant, where huge pockets receive the ore, whence it is dumped into the ships by means of big steel traveling buckets on the endless return system operated by electricity generated on the spot.

The Scotia Company delivers the ore from Wabana at North Sydney, where it is loaded into cars and hauled over the company's own line to Sydney Mines, where the coal mines and coke ovens are located. Here the Newfoundland ore is converted into great steel ingots and these are carried to the company's rolling mills at Trenton, near New Glasgow, where the steel is converted into the commodities required by the trade. The ore from the D. I. & S. Co. is conveyed to Whitney Pier, and is there delivered to the Steel plant.

**Iron Pyrites.**

In the 90's large quantities of iron pyrites were shipped from Pilley's Island, in Notre Dame Bay, to the United States; and for some fifteen years the output of the mine averaged 35,000 annually. Pilley's Island is no longer operating, though valuable deposits of pyrites are known to exist there. The quality is all that can be desired, yielding about fifty-two per cent. of sulphur. The Pilley's Island property has had a very checkered career, as many other mining properties in Newfoundland have had during the last quarter of a century.

**Incompetence and Inefficiency.**

Discussing some of the abandoned propositions some time ago with an experienced and competent mining man, the writer asked him what cause must be assigned for the abandonment of some apparently very good commercial propositions. The answer was: "Incompetency and its handmaid, inefficiency." In explanation of this he stated that "the managers in certain instances knew absolutely nothing about mining along modern lines, and they were interested mainly in their monthly cheque." This, without doubt, accounts for the ill-favor of many mining ventures in Newfoundland.

**Coal.**

Though sixty-eight years have elapsed since coal was discovered on our west coast, coal-mining is still *in unbibus*. Jukes discovered a large seam on the south side of St. George's Bay in 1838, and from data obtained he estimated the extent of this small portion of our "coal basin" at about 25 miles wide by 10 miles in length. Murray, in 1866, mapped out this region and calculated the area at 38 square miles, containing 54,720,000 chaldrons (approximately 80,000,000 tons). In 1873 Howley discovered another seam of coal at Robinson's Brook, in the same region, with a thickness of four feet. A third seam was discovered in the Grand Lake region, some forty miles from the mouth of the Humber.

Recently the Government obtained the services of an English expert, Prof. Dunstan, who made a "report"; but we have not yet gone beyond the theoretical stage, excepting in the Grand Lake region, where the Reid-Newfoundland Company operated a shaft some fifteen years abgo. The coal mined by the company was used in their locomotives for a while. and it was found to be of good quality. Why the mining operations were abandoned history sayeth not.

**Opportunities in Newfoundland.**

Newfoundland offers attractive inducements to the mineral seeker; for in addition to coal, iron, copper and pyrites, nickel is known to exist. Antimony has been found in paying quantities at Moreton's Harbor, Notre Dame Bay; galena and lead at Argentia and Lamanche, in Placentia Bay; manganese in Conception Bay; and free gol din quartz veins has been found at Ming's Bight, north of Cape John, and at Sopp's Arm, in White Bay. Asbestos, barytes, gypsum, mica, petroleum, talc and brick clays have been located at various points; and the only thing needed to develop these items is capital. The colony offers a special inducement to copper producers; and the Government provides a bounty of 3½ per cent. for smelting, on a sum not to exceed $50,000 for any one person or company annually for twenty years.

## PIONEERS OF THE YUKON.

Dawson City, Aug. 7.—Klondike celebrates to-day her twentieth anniversary. With $190,000,000 in gold to her credit she well may be proud. The honor of the magnificent yield goes chiefly to those indomitable spirits under whose auspices the day is being celebrated—the Yukon Pioneers. The trail they blazed and the foundations they laid in this realm were but preliminary to the erection of the permanent structure of a great commonwealth.

The task of the pioneers was performed nobly and unflinchingly. They came from all quarters of the globe, and only the most virile could have accomplished the feats they did. The pioneers are passing on, but their vigorous progeny takes up the task of empire building. New blood continues to come. Brawn, brain and capital combine in the Herculean task of conquering the wilderness and converting its latent wealth into assets of world importance.

The opening of surrounding territory, the gradual invasion of the entire northern zone from Hudson Bay to Bering Sea means the reclamation within no great stretch of time of an empire in the hinterland of the North American continent which will rival in wealth that of Siberia and Scandinavia and many a nation farther south.

The eyes of the world are turning this way, and when the fondest dreams of the most sanguine are realized may there remain evergreen in the memory of those who enjoy the accrued benefits and of all generations who may dwell in this favored land an appreciation of the invaluable work of those brave-hearted, indomitable heroes of Yukon's age of gold and romance—the pioneers.—Dawson Daily News.

# NEWFOUNDLAND COAL DEPOSITS

By J. W. McGrath.

In view of the fact that Newfoundland has barely averted the calamity of a coal famine, during the present winter, it should be the duty of the Government and the people to ascertain at the very earliest moment if the country really possesses coal in commercial quantities.

We have been getting supplies of coal from Sydney, C.B., for many years past, never once making a determined and practical effort of ourselves to develop those coal areas which geologists tell us exist within our country. We have gone on reading the story of our coal deposits for a century of years; we have been content in seeing tons of beautiful coal taken from seams from the west coast of the Island and placed on exhibition in our museum. As we pass along the line of railway, we see evidences of coal in many places; we know that in the Codroy Valley the farmers yoke up their teams in the winter time, when the rivers and ponds become frozen, and bring out all the coal they require for domestic use, for those several seams are exposed at the surface. Yet notwithstanding such positive proof of the country possessing vast deposits of coal, we came within a narrow margin of having all our industries closed down this winter for want of coal.

Our coal supplies from Sydney ran short, not because we had not the means to purchase same, but because there were no ships available to bring coal from Sydney. All this inconvenience and trouble could have been avoided, if in the past we had opened up our coal areas, and the large sums of money that we have been sending away year after year for coal supplies could have remained within the colony, to develop an industry which is certainly the greatest agency that any country can possess for its progress, advancement and civilization. It has been fully demonstrated for many years past, that Newfoundland possesses abundance of copper ore. Once our country stood sixth amongst the copper producing countries of the world. The iron mines at Bell Island are amongst the largest and most unique the world has ever known, and with the assured coal supplies which geologists and mining experts tell us we possess, Newfoundland should become the Lancashire of the New World.

Britain owes her supremacy and position as the greatest nation the world has ever known, as much to her coal and iron as to any other agency.

In a report upon the coal areas of Newfoundland, Mr. James P. Howley, F.G.S., says:—"As regards the existence of coal in Newfoundland, I would first ask the question: Why should there not be coal here? The same series of rocks which contain the chief coal deposits of the world are found here, on the western side of our Island in the Codroy Valley, St. George's Bay District, and on the Humber Valley. They contain in abundance, the self same species of fossil trees and shrubs that were shown to have produced coal seams elsewhere. Perfect examples of these are found embedded in the rocks in many places, and most beautiful impressions of the fossil leaves and rootlets are sometimes so abundant as to constitute thick beds of black carbonaceous earthy shale, or impure coal. Some of these beds are literally crowded with fossils. These fossil roots, stem and leaves, are the true index to coal deposits; they contain the written "testimony of the rocks," holding their historic records. When properly interpreted they tell us the facts as related above. They may be likened to samples of the materials which go to constitute coal seams, which latter are the finished products. Would it not then be a peculiar circumstance should coal deposits not exist? Indeed it would be contrary to the order of nature, or the evident design of the Great Architect of the Universe, but nature makes no mistakes. The undeniable evidence of coal deposits upon investigation has proven that Newfoundland is no exception to the general rule.

"While it may not possess so much coal as other more favored countries, nor yet such extensive and large seams, it has nevertheless been clearly demonstrated that its coal deposits are of no mean order, and it now only requires the application of capital, enterprise and skilled labor to bring about a genuine coal industry in the country.

"We will now pass on to the consideration of our own coal deposits. To begin with, we have in Newfoundland three distinct and separate coal fields. The first is situated in the valley of the Codroy Rivers; the second, inland from the south shore of Bay St. George about ten miles from the sea shore or eight miles from the nearest point of the Reid Railway; whilst the third is on the Humber Valley between the Grand Lake and Sandy Lakes. There may be a few outlying patches elsewhere, but these will be too small to be of much economic importance.

"In the first field, that of the Codroys, but a small section of the coal measures, as the coal bearing portions of the great carboniferous series is called, occurs. Nevertheless, six seams of coal have been uncovered in this section and two of these are the largest yet come across in Newfoundland. One seam at its outcrop showed a thickness of 9½ feet of good clean coal, while another gave 15 feet in total thickness and averaged, so far as examined, 7½ feet. The other four are much smaller. All this coal is of excellent quality, and some of it was used in the locomotives of the Reid Railway, giving every satisfaction as a steam producer. The Messrs. Reid did some mining here, and took about 100 or 150 tons, but the seam decreased in thickness as they proceeded, and the mining was abandoned by them, for the time being. Unfortunately this little coal field was found to be cut off by a great fault or break in the strata, but a small segment of a basin being left, jambed up against the foot hills of the long range of mountains.

"In the second, or Bay St. George area, we have perhaps the most promising, though not the most extensive coal field in the Island. This has been traced in a longitudinal line from W. S. W. to E. N. E. five miles and may extend a few miles further. The best exposures of coal are near the western end of the trough on the Middle Barachois (Barrisway) River. Here it shows a width of about two miles. In the section exposed along the banks of the river there are 12 separate coal seams ranging from a few inches to over 5 feet in thickness. They all incline inland but come to the surface again further up stream, with an opposite inclination, i.e., pointing towards the coast. On Robinson's River, two miles further east,

three seams were uncovered, one of which, the Howley seam, gave a thickness of 4 ft. 2 in. good clean coal.

"Two and a half miles still further east on a tributary of the Robinson River, known as the Northern feeder, four seams were uncovered, one only of them of any importance. Although this was but 1 ft. 2 in. at its outcrop, it was found to increase in thickness when sunk upon for a short distance. This coal, though of such small dimensions, is of superior quality, being bright, clean, and fairly hard, but of a highly bituminous character. It was extremely free from sulphur or other deleterious substances, and should afford a first-class gas coal.

"What the full extent of this most promising coal field may be has never been ascertained. Owing to the fact that it was long held by private parties, no Government felt warranted to investigate it fully under the circumstances. Consequently, a boring drill has never been put upon it with a view to ascertaining its full extent and importance. We know, however, that at least two seams of over 4 ft. thick each, the Jukes and the Howley seams, are well worth working. The coal in them is of first-class quality, and they are so situated, more especially the Jukes, that a large portion of its coal contents could be removed by open quarry work. The only thing required to render this Bay St. George field accessible for profitable working is a short branch rail or tramway to connect it with the Reid system or with the sea coast.

"Together with the Jukes, Howley and Shears seams already referred to, and taking only into account seams of 1 ft. and upwards in thickness, the section contains the following:—

On Middle Barachois River—Murray Seam, 5 ft. 4 in.; Rocky Seam, 1 ft. 5 in.; Clay Seam, 1 ft. 8 in.; Slaty Seam, 1 ft. 4 in.; "18-inch" Seam, 1 ft. 6 in.; Jukes' Seam, 4 ft. 8 in.; Cleary Seam, 2 ft. 2 in.

On Robinson River—Howley Seam, 4 ft. 2 in..

On Northern Feeder—Shears Seam, 1 ft. 2 in.

"The aggregate thickness of all the seams in this trough is 27 ft., which would give about 25,000,000 or 26,000,000 tons for every square mile they may underlay. A small outlying trough on the north side of St. George's Bay contains a few thin seams of little consequence, though possibly there may be others there of larger dimensions and better quality. The third and decidedly most extensive coal field in the Island is that of the Humber or Grand Lake area. The latter lies nearly 100 miles in a straight line N. E. from the Bay St. George trough.

"This Grand Lake area has been the most difficult of all to explore. The country for many miles in every direction is so exceedingly flat, and covered with such a thick mantle of sand, gravel, and boulders, with scarcely an outcrop of the rock formation, as to render its thorough examination one of the most difficult geological problems, perhaps to be found in North America. Nevertheless, after the most careful survey of the territory and a close study of all the facts that could possibly be ascertained, aided by the extensive use of pick and shovel, and finally of the Calyx boring rod, we have learnt sufficient to place beyond question the existence of a large and most important coal field. How large and how important has yet to be determined.

"The work done to date in this region has revealed the existence of one narrow trough of coal measures, which has been traced 11 miles longitudinally, and from all appearances must continue 5 or 6 miles further. A few good sections were uncovered on the south side of Grand Lake, about a mile from the shore. The first of these on Aldery Brook, exhibited fifteen seams of coal, doubled up almost in the form of the letter U.

"Most of the seams are quite small, but those over a foot in thickness are:

| | Ft. | In. |
|---|---|---|
| No. 1. Seam | 1 | 6 |
| No. 2 Seam | 1 | 8 |
| No. 3 Seam | 2 | 0 |
| No. 4 Seam | 2 | 6 |
| No. 5 Seam | 3 | 0 |
| No. 6 Seam | 6 | 6 |

"The Reid Co. ran a drift along this latter seam for 150 ft., and took out over 100 tons of beautiful bright coal. This with perhaps 50 or 60 tons more from other seams close by, is still lying in the woods, crumbling under the influence of the weather.

"On Coal brook, one and half miles east of Aldery, the section exposed gave:

| | Ft. | In. |
|---|---|---|
| No. 1 Seam | 1 | 0 |
| No. 2 Seam | 1 | 0 |
| No. 3 Seam | 1 | 4 |
| No. 4 Seam | 1 | 6 |
| No. 5 Seam | 2 | 4 |
| No. 6 Seam | 3 | 5 |

"The Messrs. Reid mined some 7,000 tons from the latter seam, and used it on their railway.

"On Kelvin Brook, two and a half miles eastward, and on the same line of strike, but a small section could be reached by pick and shovel, and here again nine seams were uncovered, three of which gave the following dimensions:—

| | Ft. | In. |
|---|---|---|
| No. 1 Seam | 2 | 6 |
| No. 2 Seam | 3 | 8 |
| No. 3 Seam | 6 | 2 |

"Three and three-quarters miles eastward of Kelvin Brook, close by the railway track and about a mile beyond Goose Brook, three seams were uncovered some years ago, and one of them was mined to some extent by the Messrs. Reid. After they had abandoned the enterprise, the Calyx boring drill was brought into requisition, and sixteen were put down near Goose Brook, resulting in the locating of a new trough of the Coal Measures, containing thirteen new coal seams. Most of these were again small, but omitting those already mentioned near Goose Brook, we have:

| | Ft. | In. |
|---|---|---|
| No. 1 Seam | 3 | 0 |
| No. 2 Seam | 2 | 6 |
| No. 3 Seam | 1 | 0 |
| No. 4 Seam | 2 | 4 |
| No. 5 Seam | 1 | 0 |
| No. 6 Seam | 1 | 6 |
| No. 7 Seam | 4 | 4 |
| No. 8 Seam | 6 | 0 |

"I would merely add here that we do not yet know the full extent of any of those coal fields, and it may take many years, if ever, to find out all there is yet to be learned about them. I am quite convinced from what I have seen, that there is yet at least one other trough of coal measures nearer the Grand Lake, of

which we know nothing, as to its extent, and value, or of its coal contents.

"It has taken a long time to beat down the prejudice and remove the indifference displayed about our native coal deposits. Now that happily there seems to be a growing belief in their existence I hope it will not take quite so long to get things in motion.

"In further proof of the existence of coal in Newfoundland in large quantities and of good quality I give the following statements:—Mr. Hugh Fletcher, M.E., visited and inspected the Cleary Coal areas in Bay St. George. Speaking of the Juke's Seam, he says:— 'The coal in this seam is bituminous, free from sulphur and of the very best quality.'

"Mr. A. D. Turnbull, M.E., who inspected the Cleary seam in 1910 says of the Juke's seam:—'The seam has been exposed for a length of 102 feet and averages four feet in thickness, the coal is excellent.'

"I append several assays of coal taken from different seams. These assays were made for the Newfoundland Government by William H. Fitton, F.G.S., F.S.Sc., M.E., England:

| | From Coal Brook No. 3. | From Coal Brook No. 4. | From Kelvin Brook No. 1. |
|---|---|---|---|
| Moisture | 9.93 | 5.02 | 8.44 |
| Volatile Matter | 24.01 | 31.25 | 28.54 |
| Fixed Carbon | 49.15 | 54.03 | 5.07 |
| Ash | 16.14 | 8.66 | 111.53 |
| Sulphur | .77 | 1.04 | 1.42 |
| Coke in closed vessel. | 66.06 | 63.73 | 63.92 |

**From Bay St. George.**

| | Clary Seam | Jukes Seam | Howley Seam | Shears Seam |
|---|---|---|---|---|
| Moisture | 3.548 | 3.036 | 2.784 | 4.90 |
| Volatile Matter | 30.897 | 30.344 | 29.784 | 33.12 |
| Fixed Carbon | 55.229 | 60.142 | 54.468 | not given |
| Sulphur | 3.946 | 1.963 | 3.047 | 0.44 |
| Ash | 6.380 | 4.515 | 10.430 | 3.16 |
| | 100.000 | 100.000 | 100.000 | Coke 61.371 |

**From Aldery Brook. Grand Lake.**

| | No. 2 | No. 6 | No. 7 | No. 9 | No. 15 | No. 16 | No. 17 | No. 20 |
|---|---|---|---|---|---|---|---|---|
| Moisture | 10.22 | 5.80 | 10.77 | 13.71 | 15.78 | 5.83 | 4.32 | 7.41 |
| Volatile Matter | 24.39 | 31.44 | 16.55 | 26.83 | 30.30 | 33.62 | 16.84 | 30.73 |
| Fixed Carbon | 48.51 | 57.86 | 33.89 | 51.06 | 45.29 | 55.28 | 72.66 | 52.59 |
| Ash | 15.72 | 4.08 | 37.86 | 7.56 | 8.08 | 4.49 | 5.53 | 7.71 |
| Sulphur. | 1.16 | .82 | .93 | .84 | .55 | .79 | .85 | .66 |
| | 100.000 | 100.000 | 100.000 | | | | 100.000 | 100.000 |
| Coke, closed vessel | 65.39 | 62.76 | 72.68 | 59.56 | 33.92 | 60.56 | 78.84 | 61.85 |

## ACTIVITY IN ONTARIO GOLDFIELDS.

In a review of activities in Ontario gold fields, Homer L. Gibson & Co. say:

The following properties, which were idle a year ago, are now being developed: Jupiter, McIntyre Extension, Success, Newray, Davidson, Dome Extension, West Dome, Premier, Anchorite, Maidens-McDonald, Augarita, and Chisholm Vet. In addition to the above it is probable that arrangements will be completed shortly for resumption of operations at the Apex, Foley-O'Brien, Little Pet, Platt Veteran, Perseverance, and other properties in scattered locations. This gives an indication of the increased interest now being manifested in the camp.

These operations have brought into being a largely increased demand for electrical power. The first installations of power plants by the Northern Canada Power Company, at their two plants at Sandy Falls and Wawaitan Falls, were thought to be ample for the needs of the camp for years to come, but the demand for power has been so imperative that many additions to the original plants have been necessary.

Surveys of new power sites have been made and plans for the installation of new units are now being considered. In order to conserve the water supply through the dry seasons, large storage dams have been built at different points on the head waters of the Mattagami River. By this method, and by the installation of new plants at several new sites, it is hoped that the demand can be accommodated.

In the Kirkland Lake district preparations are being made for the use of the electrical power which will probably reach the camp during November. Construction of the transmission line is now under way, and as the contractors will be penalized if completion is delayed beyond a certain date, there will undoubtedly be made to have the "juice" into the camp by that date. Operations at Tough-Oakes are resulting satisfactorily from the standpoint of production and development. During July 3,700 tons of ore of an average value of $23.80 were milled, resulting in a gross production of over $80,000. Camp buildings are being erected at the Wright-Hargreaves in preparation for a programme of development during the winter months. Installation of the larger plant at the Lake Shore is about complete, and the mill at the Teck Hughes is ready to run. Developments at the McKane property of the Kirkland Lake Gold Mines, under option to the Beaver Consolidated, make it appear certain that operations will continue there, and lead to the hope that it will become an important producer. The operators are hopeful that a branch line of the T. & N. O. Railway will be constructed, but the advent of cheap power will to a certain extent obviate the necessity of such a line.

In the Boston Creek camp operations are going ahead steadily at the Kenzie claim and R. A. P. Syndicate workings, which are being handled jointly, so far as underground development is concerned. Some very good ore has been opened up in this working, and it is hoped that a little more development will justify the erection of a milling plant. Underground operations have been resumed at the Miller Independence. A shortage of water for the plant caused cessation of underground work some weeks ago, but it is thought that any further difficulty along this line will be avoided. Cross cutting for the vein will be continued. No. 2 vein is stated to be showing up very well in the work so far done, which has consisted of two test pits a few feet in depth. Considerable free gold and tellurides appear in the vein matter.

# THE LAKE SUPERIOR CORPORATION ANNUAL REPORT

The Lake Superior Corporation's report for the year ended June 30, 1916, shows that net earnings of the subsidiary companies amounted to $3,503,471, from which has been deducted $331,765 deficiency from the previous year, leaving $3,171,705. No provision was made for dividends, the earnings being distributed as follows:

| | |
|---|---|
| Interest on Bonds of Subsidiary Companies and Bank and other Advances, etc. | $1,513,539.29 |
| Amount written off in respect of Discount and Expenses of Securities sold, etc. | 206,680.54 |
| Amount set aside for Sinking Fund Payments, etc. | 667,173.16 |
| Appropriated set aside for Sinking Fund Payments, etc. | 667,173.16 |
| Appropriated for Reserves, Depreciation, Renewals, etc. | 425,594.92 |
| Carried forward by all Companies | 358,717.94 |

Mr. W. C. Franz reports on the operations of the subsidiary companies as follows:

**Algoma Central and Hudson Bay Railway Company.**

A settlement of outstanding questions as between the Algoma Central & Hudson Bay Railway Company, the Algoma Central Terminals Limited and The Lake Superior Corporation has been arrived at which it is believed, will lead to a speedy discharge of the receivers of both the railway company and the terminals company. A bond-holders' committee, representing both railway and terminal bondholders, has been appointed, and in this committee has been vested the outstanding common stock of the railway company for the purpose of exercising all voting and other rights incidental thereto. Of the $5,000,000 preferred shares issued to and held by the public, $3,000,000 of a new substituted non-cumulative preference stock will be issued as fully paid to the bondholders' committee for distribution amongst the railway bondholders and terminal bondholders. The corporation are the holders of $5,000,000 of common stock and subject to the voting trust referred to, will retain this holding intact and in addition will receive in satisfaction of the debt of $318,800 a like amount of the railway company's second mortgage bonds. Monies representing the unexpended balance of the proceeds of the terminal bonds will be paid over to the bondholders' committee, for the benefit of the railway company in the development of its properties and otherwise. Both the terminal bondholders and the railway bondholders have made certain modifications and concessions as to the payment of their respective interest.

Through the increased activity of the Algoma Steel Corporation, and of the various industries at Sault Ste. Marie, the outlook is much better than it has been for some time. Whilst the railway company's report for the year is not yet to hand, it is understood that earnings, particularly from the steamship line, show a substantial increase.

**The Algoma Eastern Railway Company.**

The earnings of this railway show an increase. During the year financial arrangements were made through which the railway has been equipped with additional rolling stock, necessitated through prospective additional traffic.

Patents have been received in respect of the entire land grant lands of the railway, aggregating nearly 700,000 acres. Every effort will be made to deal with these lands as to bring about all possible benefits to the railway company, especially in a financial direction.

As will be seen from the balance sheet submitted the policy of reducing the bonded indebtedness of the Corporation has been followed as far as circumstances permitted. Directors regret that the revenue of The Lake Superior Corporation is not sufficient to permit of the payment of Interest other than on its First Mortgage Bonds. The Algoma Steel Corporation has undoubtedly strengthened its position, and in the disposition of its earnings has pursued a conservative policy, which will add value to the Steel Corporation as a whole, and consequently to The Lake Superior Corporation's interests therein.

One fact in connection with the Algoma Steel Corporation must be borne in mind, and it is that further finance is necessary in order to put the steel plant on a proper footing in reference to the manufacture of a much more diversified product. As was foreshadowed in the previous report, The Lake Superior Corporation must sooner or later be called upon to consider its present interest in the Steel Corporation in reference to the necessary development of the latter.

Mr. W. S. Stavert has retired from the Presidency, and from the Board, and does not seek re-election. Mr. John T. Terry has also retired from the Board. Mr. T. J. Kennedy, who was elected during the year in place of Mr. Terry, has also been compelled to resign through ill health. Mr. Thomas Gibson has joined the army, and his services in the meantime are not available.

**The Lake Superior Corporation.**

Balance Sheet as at 30th June, 1916.

Assets.

| | |
|---|---|
| Investments and securities | $47,974,556.33 |
| Real estate | 98,944.70 |
| Balances due by Subsidiary Companies | 545,403.31 |
| Mortgages held | 190,071.35 |
| Cash in bank and on hand | 206,297.22 |
| Cash in bank to meet unpaid interest coupons | 24,325.00 |
| Funds in Trustees' hands representing proceeds of sale of investments | 136,356.16 |
| Mineral lands | 45,978.29 |
| Accrued interest on Algoma Steel Corporation purchase money bonds owned | 24,166.66 |
| Accrued interest on Mortgages held | 2,827.70 |
| Miscellaneous assets | 770.52 |
| Office furniture and fixtures | 2,643.66 |
| Total Assets | $49,252,340.90 |

Liabilities.

| | |
|---|---|
| Capital Stock, 400,000 shares of $100 each | $40,000,000.00 |
| First mortgage 5 per cent. bonds | 5,472,000.00 |
| Income bonds | 3,000,000.00 |
| Interest coupons unpaid | 25,900.00 |
| Accrued interest on first mortgage bonds | 22,800.00 |
| Miscellaneous accounts payable | 3,036.10 |
| Allied companies voluntary relief association | 7,125.00 |
| Reserve Account—for depreciation of investments | 710,953.28 |
| Income Account—Balance at credit | 10,526.52 |

| | |
|---|---|
| Contingent Liabilities—Bonds of Subsidiary Companies guaranteed by the Corporation of which there were issued and outstanding at 30th June, 1916: | |
| Algoma Central & H. B. Ry. | $10,080,000.00 |
| Algoma Eastern Ry. Co. | 2,500,000.00 |
| Algoma Central Terminals Ltd. | 4,999,526.66 |
| Algoma Steel Corporation Ltd.— | |
| First and Refunding Bonds | 14,000,000.00 |
| Three-year Notes | 2,432,500.00 |
| Total liabilities | $49,252,340.90 |

The directors of the company for 1915-1916 were Herbert Coppell, New York; John S. Dale, New York; W. C. Franz, Sault Ste. Marie, Ont.; Thomas Gibson, Toronto; James Hanson, Sault Ste. Marie, Ont.; Frederick McOwen, Philadelphia, Pa.; Alex. Taylor, Toronto; Harvey J. Underhill, South Orange, N. J.; Walter K. Whigham, London, Eng.; A. H. Chitty, Sault Ste. Marie, Ont. The officers were as follows: W. K. Whigham, president; H. Coppell, W. C. Franz, and J. Hanson, vice-presidents; Alex. Taylor, secretary; J. Hanson, treasurer.

## WAGES AT ROSSLAND AND TRAIL.

Increases in wages at British Columbia mines and smelters have been made during the summer. The wages will vary with the prices of copper and lead. Mr. J. D. McNiven, Vancouver representative of the Department of Labour, has made to full report in regard to the arrangements made in settlement of the disputes, and we reprint the following from the "Labour Gazette":—

The dispute at Trail arose as the result of an agitation in March last among the men employed at the smelter for an increase in wages, their claims being based on the increased cost of living, the high price of metals and the general advances which had been made at other smelters in the province and in the neighboring States. During April a committee from the union waited on the management of the smelter and submitted a wage scale and general agreement which provided for a cumulative increase in pay based in the price of silver and lead, a voluntary check-off and a three-year agreement with the union. The company did not accede to the union's proposal, but on May 1 announced an advance to all employees of 25 cents per day. This offer was submitted to a referendum vote of the union and was respected. Negotiations were continued further, but without result. On June 17, Mr. McNiven, by the Minister's instructions, visited Trail and assisted in bringing about a resumption of negotiations, and finally on June 27 the company submitted a proposal which on the referendum vote of the union was accepted, and which resulted in an increase in wages to all employees in and about the smelter of 40 cents per day. The number of men affected or provided for in the increase is given as 1,520, nearly one-third of whom were employed on the construction of new buildings and equipment. The text of the memorandum of the settlement is as follows:

"On and after July 1, there will be an increase of 15 cents per day to all men employed at or around the smelter, so long as the Montreal price of lead remains at 8 cents or better, and the Montreal price of copper remains at 25 cents per pound or better; with our guarantee that this additional 15 cents per day will be paid for at least three months from the first of July, 1916, no matter what the current prices of lead and copper may be. We are able to do this through having sold our lead production to the Munitions Board for the first three months at a fixed price.

"This increased rate shall continue so long as lead remains above 8 cents, and copper above 25 cents.

"If and when after the first of October lead falls below 8 cents and copper below 25 cents, but lead is still above 7 cents and copper above 22 cents, the increase will be 10 cents per day instead of 15 cents per day.

"If and when after the first of October, 1916, lead falls below 7 cents and copper below 22 cents, but lead is still above 6 cents and copper above 18 cents, the increase shall be 5 cents per day instead of 15 cents per day.

"If and when the Montreal price of lead is below 6 cents and the Montreal price of copper is below 18 cents, the company reserves the right to revise the wage scale according to conditions prevailing at that time, having special regard to the prices current for necessaries at that time. So long, however, as the Montreal price of lead is 6 cents or better, and the Montreal price of copper is 18 cents or better, the company will pay a minimum wage of $3 per day to all employees.

"Except as notified by this letter, the scale made effective on the first May, 1916, shall prevail."

Following the settlement of the smeltermen's dispute at Trail, Mr. McNiven proceeded to Rossland where the Rossland Miners' Union had made a demand upon the Consolidated Mining & Smelting Company and Le Roi No. 2, Limited, for a general increase in wages of 25 cents per day and an agreement to include the check-off covering a period of three years. After a number of conferences between the mine managers and a committee from the union, and several propositions and counter-propositions on both sides, the following arrangement was reached on July 16:

When the price of copper shall be below 16 cents per pound the scale of wages shall be the minimum scale.

"When the price of copper shall have been at or above 16 cents per pound for a period of one month, wages underground shall be advanced by 25 cents per day and wages on the surface shall be advanced 15 cents per day.

"When the price of copper shall have been at or above 18 cents per pound for a period of one month, wages underground shall be advanced by a further 25 cents or a total bonus of 50 cents per day, and wages on the surface shall be advanced 10 cents per day, or a total bonus of 25 cents per day.

"Should the price of copper advance to 25 cents per pound or over, and remain at 25 cents for one month or longer, at the next period when the copper reduces to below 18 cents per pound, the 50 cents bonus shall continue to men underground and 25 cents bonus shall continue to men on surface for a period equal to that in which the price of copper remained at 25 cents per pound or over, but should the price of copper reduce to below 16 cents per pound during the aforesaid period, the bonus paid to both underground and surface men shall be 25 cents above the minimum scale for the aforesaid period.

"This agreement shall date from January 1, 1916, and shall continue for a period of three years and thereafter until terminated by two months' notice on either side."

## SULLIVAN MINE, EAST KOOTENAY, B.C.

The Sullivan mine, in Fort Steele division of East Kootenay, British Columbia, has for several recent years been the largest producing lead mine in Canada. An idea of its importance can be obtained from a comparison of the lead production figures for 1915, as shown in the last Annual Report of the Minister of Mines for British Columbia. The total quantity of lead obtained from all the mines of the Province in 1915, was, according to the published official statistics, 46,503,590 lbs.; the proportion from the Sullivan mine was 26,320,307 lbs., or more than one-half. The Consolidated Mining & Smelting Co.'s annual report for the fiscal year ended September 30, 1914, gives the total output of ore from the Sullivan mine up to that date as having been 219,567 tons, containing 108,211,732 lbs. of lead and 2,126,148 ounces of silver, together making a gross value of $5,244,634. The output from September 30, 1914, to the end of August, 1916, was approximately 112,000 tons of ore, shipments having this year been of zinc as well as lead ore.

The following account of the property, prepared by Mr. John D. Galloway, Assistant Mineralogist for British Columbia, has been taken from the recently issued Annual Report for 1915:

"The Sullivan mine, owned by the Consolidated Mining & Smelting Company of Canada, is situated about two miles and a half from the town of Kimberley. The present mine-workings and buildings are situated on the summit of a low rounded hill rising from Mark creek. The mine was staked in 1895, and in 1896 sold to a Spokane company, which operated it for a time, and later there was built the smelter at Marysville to treat the ore from it. This smelter was unsuccessful, primarily because the ore is not suitable to smelting by itself, but requires to be mixed with other ores and fluxes. In 1908 the smelter, after various remodellings and attempts to run, was finally closed, and in 1910 the mine and smelter sold to the Consolidated Mining & Smelting Company. This company has now practically dismantled the Marysville smelter and all the ore is sent to the company's smelting works at Trail. Since that time the mine has been worked steadily and has made continuous ore shipments.

"The production from the mine for the year 1915 was 44,084 tons, containing 474,253 oz. silver and 26,320,307 lb. lead. The average assay value is therefore about 30 per cent. lead and 10.75 oz. silver to the ton. And the gross value of the ore is about $33 a ton.

"The oldest existing opening is a shaft with several levels, and from this, together with 'glory-holes' and open stopes, the first ore was extracted. The present main working-level is a tunnel which taps the shaft at 100 ft. below the collar. There is another level 100 ft. lower than this on which there are also extensive drifts and stopes, and from which the ore is hoisted to the upper tunnel and out that way. The last report of the Consolidated Company, for the fiscal year ended September 30th, 1915, gives the total footage of development-work done at the Sullivan mine as being 29,324 ft., or 5.55 miles. The following figures, from the same report, show the work done in that year: Drifting and crosscutting, 2,278.5 ft.; raising, 286 ft.; sinking, 26 ft.; total, 2,590.5 ft. Diamond-drilling, 3,838 ft.

"In June, 1915, a commencement was made to drive a long tunnel from a point on Mark creek about 700 ft. below the upper workings. This tunnel will be 8,000 to 9,000 ft. long and will eventually be the main working-level of the mine. This low-level tunnel was only decided on after extensive diamond-drilling, both from the upper workings and from various points on the surface, had disclosed the existence of enormous ore reserves. The ore from the upper workings is at present taken down to ore-bins by an aerial tramway; these ore-bins are situated on Mark creek and a railway spur connects directly with them. The new tunnel is situated a short distance from these ore-bins and will have railway connections for handling the ore directly below it. This tunnel is, therefore, for the purpose of handling the ore more efficiently and reducing costs all round, and at the same time it will make possible the handling of a larger daily tonnage.

"An innovation in mining in the Province was the installation at this tunnel of a mucking-machine to do away with mucking by hand-shovelling. The machine is made by the Meyers-Whaley Company, of Knoxville, Tennessee, and is reported to be giving satisfactory service. It consists essentially of a shovel or dipper, very like that on a steam-shovel, but smaller, which is thrust forward into the muck, secures a load and throws it back on to a travelling belt, which elevates the muck and delivers it into a mine-car at the back of the machine. The shovel is very flexible and can be forced into the muck at different angles and from side to side of the tunnel. It consists really of two square box-like shells, the inner of which throws the muck back through the back end on to the belt after the shovel has been drawn out from the pile of muck. For convenience in operating two belts are used, one delivering the muck on to the other, and this latter one delivering into the mine-car which is run in under the discharging end of the belt. These belts run over the body of the machine, the operating mechanism being placed underneath. The whole machine is 30 ft. long, weights 9½ tons, and is driven by a 12 h.p. direct-current motor situated within the machine. It is mounted on wheels and runs on the mine-track, and can be run in and out as desired by means of its own motor. One man operates the machine, and a sufficient supply of mine-cars to keep it going is ensured by having a double track in the tunnel. It is claimed that this machine will muck out in from half an hour to an hour what would take two men with shovels a shift of eight hours to do. The obvious advantage of such a machine is that, where it is desirable to rush work on a tunnel, the quicker handling of the broken rock enables drilling at the face to be resumed more quickly, with a resulting increased speed of tunnel-driving.

"At the time of visiting the mine this lower tunnel was in 200 ft.; at the first it had gone through surface wash and sand, but was then in 'hard-pan' that was very hard and studded with boulders, which proved troublesome material to drive through, as it was too hard to pick and had to be drilled, but would not break well. Up to that time the mucking-machine had, therefore, not been given a trial of what it could do working on straight broken rock.

"This tunnel is 8 by 8 ft. in the clear and will be laid with a double-mine track throughout. It is driven below the foot-wall of the ore-body and at intervals crosscuts and raises will be put through to reach the ore-body. With the flat pitch of the vein this tunnel will give about 1,800 ft. of backs above it. When it is considered that the greatest depth attained on the vein as yet is not more than 250 ft., it can be realized what an immense reserve of possible ore this tunnel will open up. It is not known to what depth ore has been proven by means of diamond-drilling, but from the guarded utterances of the mine officials the writer is convinced that the ore reserves in the mine are very great.

"The ore-body, which is vein-like in form, pitches into the hill at an angle of 30 deg. The average stope width is perhaps 20 ft., but runs up to 60 and 80 ft. in many places. The ore is mined by the 'big-stope method,' in which the ore is broken down and left in the stope and the work advanced upward, always leaving in enough ore to enable the men to reach and drill the overhead face. Some ore and waste has to be drawn off as the work proceeds, and the balance is taken off from below when the stope is finished. Pillars are left in places to support the hanging-wall, and in others a cribbing of timber is built up and filled in with waste rock, which thus makes an artificial pillar. Occasionally, square-setting is used, but not as a rule.

"The ore is taken out of the main tunnel by an electric motor and cars and dumped into bins. From here it is fed through a jaw-crusher and on to a picking-belt. When first-class ore is going through, the pickers pick out waste and zincy ore and the galena is allowed to pass on to a bin. When second-class ore is going over the belt, galena and waste are picked out and the zinc passes on to a bin, from which it is run out to a zinc-dump, which already contains many thousands of tons of zinc ore. The galena is in each case run into bins, from which it feeds into the buckets of the Riblet aerial tramway. This tramway is of the usual type, with automatic feed and dump and requiring one man to attend to it. It is 4,000 ft. long, with a drop of 600 ft.

"The power plant for the mine, which is situated beside the railway ore-bins on Mark creek, consists of a 30-drill compressor and alternating-current and direct-current generators. It is run by water-power for part of the year and by steam during the winter months when the water is frozen.

"The 'vein' in the Sullivan mine has been described as a replacement ore--body by Dr. S. J. Schofield, of the Geological Survey of Canada. The following is a quotation from his report:—

"The deposit occurs in the Aldridge formation, which here strikes about north and south, with a dip of 10 to 60 deg. to the east. This formation consists of thin-bedded argillaceous quartzites and heavy-bedded, purer quartzites. The ore-body conforms in dip and strike with the quartzites and cannot be called a true fissure-vein, but a replacement deposit in which the sulphides replaced the fine-grained quartzites. The hanging-wall and foot-wall are not well defined and the ore grades gradually into the country-rock, except when the country-rock consists of thin-bedded slaty quartzites which are evidently difficult to replace. In the upper workings close folding later than the ore-deposition increases the real width of the ore. This was well shown in the glory-hole at the time of the writer's visit. On the 60 ft. level the dip of the ore-body in places approximates 25 deg. and on the 100 ft. level the dip increases to 70 deg., which is also the dip of the surrounding quartzites. As far as exploited, the maximum stope width is 120 ft. and the maximum stope length 325 ft. There are ten levels, the north level being 100 ft. below the surface and forming the entrance to the mine.

"The ore-body is arranged in distinct zones which grade imperceptibly into each other. The centre of the lode is occupied by a fine-grained mixture of galena and zinc-blende in which masses of purer galena occur in large lenses. It is these lenses that constitute the valuable ore-shoots in the mine. They occur either singly or as two parallel shoots separated by one of poorer grade. The gangue in this inner zone is absent, except for a few idiomorphic crystals of a pink manganese-bearing garnet. This inner zone gradually passes exteriorly into a fine-grained mixture of pyrite, pyrrhotite, and zinc-blende, which contains as a gangue numerous crystals of an almost colourless garnet, with some grains of actinolite or possibly diopside. The sulphides gradually diminish in amount and finally give way, especially on the foot-wall, to a fine-grained chert which is present when the country-rock is a heavy-bedded purer quartzite, and is absent when a more argillaceous slaty member constitutes the wall-rock. No garnets or other gangue minerals were noted in this cherty zone. The chert gradually passes into the normal quartzite, in which, with one exception, all contact minerals, such as garnet, diopside, and actinolite, are absent.

"As mentioned, the ore-deposit as a whole is a conformable replacement of fine-grained argillaceous quartzites by fine-grained galena, zinc-blende, and iron sulphides. Replacement is very well shown in most parts of the deposit, since alternate banding of ore and quartzite is seen near the periphery of the ore-masses where the relative susceptbility to replacement of the laminae of the quartzite is different. Joining these favorable bands are numerous interlacing veinlets of sulphides which representing an intermediate stage in complete replacement of the quartzite. Examined microscopically, the sulphides appear to have entered between the quartz grains of the quartzite and then to have attacked the quartz itself. The sulphides, entering along the favourable laminae, replace the muscovite also. Evidently muscovite has been formed previous to the introduction of the sulphides."

It will be noted from this description that the galena occurs in the centre of the ore-body as large cores or lenses and containing a low percentage of zinc—5 to 10 per cent. Surrounding these galena-lenses are large bodies of zinc and pyrrhotite containing 15 to 30 per cent. of zinc and varying amounts of galena, from 20 per cent. down to none. This zinc-pyrrhotite zone either gradually fades away into unaltered wall-rock or in some cases stops at a well-defined wall. The quantity of this somewhat low-grade zinc ore is considerably greater than that of the galena ore. Much of the ore in the mine has a composition about as follows: Lead, 20 per cent.; zinc, 20 per cent.; iron, 20 per cent. It is evident that such an ore is unsuitable as feed for a lead blast-furnace owing to the high zinc content. Since the Consolidated Company acquired the mine, numerous tests have been made to concentrate this ore in such a way as to separate the lead and zinc and produce a concentrate of each of these minerals that could be profitably treated. Water and magnetic concentration tests of various kinds were tried, but these all proved unsuccessful. The main reason for this difficulty is that the mixture of galena, sphalerite, and pyrrhotite is generally so intimate and fine-grained as to be a microscopic intergrowth of crystals, and it has been found impossible to grind the ore fine enough to separate it into its component minerals. Further, the sphalerite and pyrrohtite are so nearly of the same specific gravity that it is impossible to so separate the pyrrhotite as to make a zinc concentrate of a marketable grade. After exhausting the possibilities of treating the ore by ordinary concentration treatments the company turned its attention to chemical and electrochemical methods of extracting the zinc from the ore, which would leave the residue with only lead and iron contents, together with all the silver value; this residue would then be suitable for the leadblast-furnaces.

After some preliminary experimenting the Consolidated Company entered into an agreement with French's Complex Ore Reduction Company, Limited, whereby a thorough testing of this latter company's zinc process on Sullvan ore was to be made. To this end an experimental

plant was erected at the smelting-works of the Consolidated Company at Trail, and a series of tests made under the supervision of Thomas French, son of Andrew Gordon French, the originator of the French ideas and patents. Apparently some amount of success was obtained in these experiments, as, although the agreement with the French Company was terminated, further experimental work was carried out along the same general principles, but with some modifications in details. This latter work was conducted by F. W. Guernsey, on the Consolidated staff, and under his direction the experimental plant, for some time, made a production of ½ ton of electrolytic spelter a day.

Having demonstrated that the process was satisfactory, the Consolidated Company in July, 1915, commenced the erection at Trail of a zinc plant designed to produce 25 to 35 tons of spelter a day. This plant is now in operation, and a contract for the entire output of this spelter has been made with the Imperial Munitions Board. This plant is designed solely to treat Sullivan ore, but may be extended later to treat custom zinc ores. The successful operation of this plant will mean a great deal to the Sullivan mine, as it will turn the vast reserves of zinciferous ores into actual instead of potential assets. By extracting the zinc from ore containing 20 per cent. zinc and 20 per cent. lead, not only the zinc is obtained, but the lead content is also made available, which opens up great possibilities for the future life of the Sullivan mine.

### "SAFETY FIRST" AT GRANBY CO.'S MINES.

The following notice was several weeks ago posted at the Granby Consolidated M. S. and P. Co.'s Hidden Creek mine, near Anyox, Observatory Inlet, British Columbia::

"The heads of all departments have been working together with a view of putting into effect the best organized scheme possible for furthering the important work of the 'Safety First' movement, and it has been decided to appoint separate committees from the underground and surface men, respectively.

"With the object of getting all concerned—which means everybody in camp—interested and working together for 'Safety First,' these committees will only be appointed for a month, when new committees will be chosen in each of the departments named. In this way it is certain that all men interested in the movement, and who have at heart safer and better working conditions for themselves and their fellow employees, will sooner or later be on one or other committee, and be enabled to press forward improvements which come under their notice.

"It is earnestly hoped that any one seeing or knowing of any place at all dangerous and where conditions can be improved, will feel at perfect liberty to without delay to bring the matter to the notice of a member of the committee concerned, and every one in camp is assured that suggestions are eagerly sought, will be welcomed, will receive careful consideration, and, wherever practicable, will be at once carried out.

"The heads of all departments wish to impress upon everyone the fact that they fully realize that a suggestion coming from a man shows that his interest is in his work and the camp, and he may therefore feel sure that his suggestion will be appreciated, whether or not it be one that can be carried out."

The "Safety First" organization established in connection with the Hidden Creek mine has been inaugurated with the full sympathy and zealous co-operation of the Granby Consolidated Co.'s resident mine superintendent, Mr. E. E. Campbell, and those in charge of the several departments under him. Meetings of both committees, underground and surface, have been held, and much has already been done to improve conditions and lessen working risks. In addition the mine surgeon has arranged to give instruction in "First Aid to the Injured" to four classes, each of ten men, the company finding text books free.

## DEVELOPMENT OF MANITOBA'S MINERAL RESOURCES

Writing in the "Wninipeg Telegram," Mr. Hay Stead, who accompanied Professors Wallace and DeLury on their recent visit to mineral discoveries north of The Pas, Manitoba, says in part:

acted. Men began to drift into the country, casually

For many years tales have been told of the mineral wealth of the north country. Long over a century ago Hearne came back to his employers on the shores of Hudson Bay with marvellous tales of wonderful mines to be found somewhere within the Arctic circle, near the river he names from his discovery, the Coppermine. To-day, an echo of that story of Hearne's comes to us in the reported Stefansson story of the discovery of immense copper deposits on one of those continent-like islands near the mouth of Hearne's river.

Ever since Hearne told his story, men have dreamt of such things, and, on occasion, the dreamers have and in a haphazard sort of way, following their vision with a newly stimulated faith.

These were a new type of men, equipped for the work, educated in the recognition of mineralized rock, familiar with what they sought, and where to seek it. They found what they had sought—gold, and gold in quantity, of a richness in the surface that promised great things for values in depth.

At Beaver Lake, just over the boundary in Saskatchewan, the first gold field of this northland was staked. Later, 150 miles further east, at Herb Lake, or Wekusko, as it is called on the maps, another discovery was made. Scattered finds were made throughout a district some twenty or thirty miles wide from north to south, and over a hundred and fifty miles from east to west, not only of gold, but of all manner of minerals, in traces and in rich quantity; copper, gold, silver, zinc, lead, sulphur, iron and molybdenum. Gold quartz is found at Herb Lake, Little Herb Lake, Island Lake, Cranberry Lake, Reed Lake and Athapapuskow Lake. Sulphide ores, containing gold and copper principally, but with silver, zinc, lead and iron, in various places in varying quantity, are found at Lakes Flin-Flon, Schist, Athapapuskow, Wolverine, Copper, Elbow, Armstrong, Piquitona, Mystic, Big Island, Little Herb, Cranberry and Sandy Lakes, and on the Pineroot River; molybdenite at Crow Duck Bay in Herb Lake, and Phantom Lake. Silver is reported from Nelson House; and a few weeks ago a party of prospectors left The Pas for Split Lake, where a find of silver on Fox River was announced. Bismuth, too, has been found on Athapapuskow Lake.

All these discoveries have been made practically within the past two years—by a handful of prospectors. Their paucity of numbers makes their accomplishment wonderful, though it is, of a necessity, only superficial; from a prospectors' point of view the country is in its infancy. Only the edges of the waterways have been touched. Capital and men are required for anything

like an adequate sounding of resources. Yet sufficient has been found to warrant large expenditures of money, and enormous sums have been offered and paid for single properties.

In the district there is already found, and proved, millions of dollars' worth of valuable ore, while yet the very fringe of it has been examined; and that scarcely examined in the strict sense of the word, but merely skimmed.

The knowledge possessed by the general public on the subject of the mineral resources of Northern Manitoba has, up to date, been somewhat nebulous. It has been confined largely to the suitability of the surface of the country for a railway right-of-way to Hudson Bay. Of the natural resources of that portion of our province the man on the street has known practically nothing; nor, indeed, has he cared very much.

It took outsiders to realize the value of the land thus slighted by the inhabitants. It took American capital and enterprise to develop the mining resources of the Cobalt and the Yukon—and of Sudbury, southern British Columbia, and many other fields of endeavor.

That is exactly what is happening in northern Manitoba to-day. Scarcely a week has gone past this summer that has not found some American mining engineer or scientist passing through The Pas on his way north to look into the resources of the wonderful country of which he has heard, the forerunner of the capitalists to whom he will report on the possibility of getting in on the ground floor. For two years now one big mining company from the other side has had constantly in this section of Manitoba its own expert mineralogist, testing, sampling, reporting, and taking options on all sorts of likely-looking properties. This company to-day has a diamond drill outfit working on one property on Schist Lake, where they have already proved, if report is reliable, the existence of $8,000,000 worth of ore at the surface running as high as 30 per cent. copper, tons and tons of it.

All summer, there has been up in that country a mining engineer representing an Alaska company which operates one of the largest mines in the world, quietly looking around for something which might prove big enough to tempt his company into the northern Manitoba field.

Again, as the writer came out from the north, he met, on his way in, one of the foremost mineralogists of to-day, an American whose name is a household word among geologists the world over. He also was going to look over the field for some interest or interests unknown. Thus the mining field of northern Manitoba is gradually but surely being alienated from Canadian ownership.

For this, one cannot blame the prospector. The prospector is invariably a poor man; for when a prospector becomes rich he ceases to be a prospector. There is no exception to this rule. The prospector spends years of toil and thousands of dollars—which he has to earn by the sweat of his brow—in scraping the face of the country as it were, knocking off little corners of the scenery in his search, and when he has made a find, he is often totally unfitted for the specialized task of disposing of it to advantage. Is it any wonder, then, that he takes his reward wherever he can find it, and that, in almost every case, he accepts a sum far below the adequate price of his find?

In that northern country to-day there are opportunities untold for the investment of capital. The capital will assuredly be found; it is gradually being found already—south of the 49th parallel.

Northern Manitoba needs two things for its mining development, capital and prospectors; and the greater need of these two is prospectors. Given the prospectors, men of the right stamp, and the discoveries will be made. The country will be covered more thoroughly year by year. Only last fall, within a hundred miles of The Pas, within striking distance of railway traffic, a series of lakes was discovered by a member of the geological survey which had never been heard of before by any white man—traveller, trapper, trader or prospector.

And when the discoveries are made, capital will not be slow to follow. Whether that capital shall be American or Canadian or British depends on the degree of energy and enterprise, the willingness to see an opportunity and to seize it, of the respective nationalities.

The Americans are already in the field. They know the game thoroughly. They have been through it from prospect to shipping mine times without number. The fact that they are there, spending many thousands of dollars in development work, shows that they in their experience have faith in the possibilities of the country. It is a practical proof that the mineral wealth of New Manitoba has a wonderful promise, a promise that only awaits action to bring it to a glorious fruition.

## HIGHER WAGES.

According to the Department of Labor, 10,980 employees in the mining industry and 4,154 in the metal trades were given increases during the second quarter of 1916.

On May 1 the Cobalt Mine Managers' Association voluntarily increased the wages of all underground workers by 25 cents a shift, and in addition declared they would give a bonus of 25 cents a shift to both underground and surface men, when the price of silver averages over 70 cents per oz. for the previous month. About 1,200 men were affected by the change.

On May 1 an increase of 5 cents per day was granted by the Nova Scotia Steel and Coal Company to 480 coal miners at Sydney Mines, N.S., and on June 1 a further increase of from 5 to 10 per cent. was granted by the same company to 1,600 coal miners and pier men, including those who had received the 5 per cent. increase on May 1.

On May 15 an advance of 20 and 25 cents per day and 8 per cent, on tonnage or kardage was granted to 1,000 coal miners at Stellarton, N.S., by the Acadia Coal Company, in accordance with the findings of a Board under the Industrial Disputes Investigation Act.

On June 1 an advance of 6 per cent was granted in the wages of the employees of the Dominion Steel Company, which affected about 6,700 coal miners and piermen at Glace Bay, N.S., and 4,000 steel workers at Sydney.

## DELORO SMELTING & REFINING CO., LTD.

The business heretofore carried on by Deloro Mining and Reduction Company Limited has been transferred to Deloro Smelting and Refining Company Limited, under the same management and with the same officers. All contracts, agreements, and liabilities of Deloro Mining and Reduction Company Limited are assumed by Deloro Smelting and Refining Company Limited, and all debts due the former Company shall be payable to Deloro Smelting and Refining Company Limited, when due. S. B. Wright is general manager and F. A. Bapty, secretary.

## KOOTENAY GOLD EXPLORATION CO.

The Kootenay Gold Exploration Co. is the name of the organization that is operating the Granite-Poorman gold mines near Nelson, B.C. For several weeks the name of the Hardscrabble Gold Mining Co. had been used, the Hardscrabble being one of the mines of the group, but it was found that this name was too much like one already registered, so could not be accepted by the provincial registrar of joint stock companies. The organization of the new company was completed in Spokane, Washington, on August 29, with officers and directors as follows: President, H. I. Wilson, of Butte, Montana; vice-president, Andrew G. Larson, of Spokane, Washington; treasurer, John Maginnis, of Butte; secretary, R. A. Carnochan, of Spokane; other directors, T. B. Miller, of Helena, Montana, and W. E. Cullen and Roy C. Lammers, of Spokane.

The company's manager, F. H. Skeels, is reported to have said: During August we operated the 20-stamp mill about 25 days, and our gross income was $11,000. The employees of the company number 42, and the net income for the month was about $5,000. During the month the mill feed averaged in value $15 to $16 a ton; the ore came mainly from development work on the Hardscrabble vein in workings opened from the winze sunk by the men from whom we took over the property. The ore body shows an average width of 4 feet.

The water supply has of late proved inadequate for our power plant, as it has been found to do in past years during the three summer months, so we have been connected with the electric power company's system. This will enable us to push on with the work of unwatering the Poorman shaft, the water in which is now down to the first level, which leaves 200 ft. of workings to be unwatered before we can commence the crosscut from the Poorman to the Hardscrabble vein. The latter will be cut at a depth giving 300 ft. of backs. The Hardscrabble vein has been proved to extend for a long distance, but as yet an area of only about 100 ft. in length and depth has been stoped.

Crosscuts from the Poorman shaft will be extended to the ore shoot in the Poorman ledge, which rakes so strongly to the south that the upper one is only a short distance into it, while the lower one has not yet reached it. The old Poorman tunnel shows a continuous ore body for 1,100 feet.

It is our intention to eventually open the mine by a deep-level crosscut tunnel from which drifts will be run on the six veins that are known to traverse the property. Meanwhile we will be able to take advantage of much deadwork done by prior owners of the mines, which work has resulted in leaving the property in a condition requiring but little additional development to allow of profitable operation for several years.

When our present plan of development of the Hardscrabble and Poorman veins shall have been accomplished, we shall make changes in the stamp-mill adequate to deal with the ore conditions as disclosed at greater depth. This will undoubtedly include the installation of a flotation unit and making other provision to allow of from 100 to 150 tons of ore being handled daily in the mill.

## McKINLEY-DARRAGH.

It is said that the McKinley-Darragh is sampling the Cooke claims in Skead township.

## NICKEL REFINERY AT PORT COLBORNE.

We are advised that arrangements have been made for the construction of a nickel refinery at Port Colborne for the International Nickel Co. The work will be carried out by the Foundation Company, Ltd., of Montreal and New York.

## GIFFORD.

At the Gifford claim, Cobalt, a winze is being sunk on a vein carrying low silver values. Fifteen men are employed.

## APEX.

It is announced that 500,000 treasury shares of Apex Porcupine Mines, Ltd., will be offered to shareholders at 10 cents.

## U. S. IMPORTS OF NICKEL IN 1915-1916.

U. S. imports of nickel in the past three U. S. fiscal years were:

Year ending June 30th, 1914—36,420 tons ore and matte, containing 43,549,303 lbs. nickel.

Year ending June 30th, 1915—30,801 tons ore and matte, containing 37,995,019 lbs. nickel.

Year ending June 30th, 1916—56,987 tons ore and matte, containing 68,797,238 lbs. nickel.

## U. S. IMPORTS OF NICKEL.

Statistics compiled by the U. S. Bureau of Commerce show the following imports of nickel matte and ore during the fiscal year ended June 30, 1916:

| From. | Gross Tons. | Nickel Contents, Pounds. | Values. |
|---|---|---|---|
| France ..... | 297 | 514,828 | $ 128,154 |
| Canada ..... | 52,742 | 64,622,286 | 8,596,921 |
| Peru ..... | 1 | 118 | 13 |
| Australia ..... | 1,329 | 1,268,084 | 279,332 |
| French Oceania .. | 2,618 | 2,391,922 | 516,285 |

These comprise the entire imports for the year named.

## BRITISH-AMERICAN NICKEL.

The Toronto Globe says: In connection with the granting of a lease to the British-American Nickel Company for the development of power on the Wahnapitae River to be used in connection with their proposed smelting works, it appears that the plans have been filed with the Ontario Government department for consideration. The water powers are said to be comparatively small, and the development is put at 4,000 to 5,000 horsepower. The company at first, it is stated, wished the Hydro to develop, but the Government authorities could not see eye to eye with this as it would entail a considerable capital expenditure in the interests of a private corporation. This point of view is said to have been recognized by the company.

## LABOR INVESTIGATION AT COBALT.

By an order of the Privy Council of Canada, Messrs. E. Coatsworth, E. T. Corkill and Jos. Gibbons were recently appointed a Royal Commission to enquire into the nature and causes of the unrest in the mining industry in the Cobalt district. The commission has been holding sittings at Cobalt, all parties interested being invited to attend and present evidence bearing upon the subject. The commission will report to Hon. T. W. Crothers, Minister of Labor.

# PERSONAL AND GENERAL

Mr. W. E. Segsworth, Toronto, has been elected a member of the Institution of Mining and Metallurgy.

Mr. H. A. Kee, formerly mine superintendent at the Nipissing mine, Cobalt, is now in charge of the Kerr Lake mine.

Mr. P. B. McDonald has resigned from the editorial staff of Mining and Scientific Press.

Mr. J. C. Nichol, of the Canadian Copper Co., and W. W. Mein, of New York, visited the Dome mine recently.

Mr. W. Pellew-Harvey, of London, England, was in British Columbia last month, en route to Australia to examine mining property in that country. He was a resident in Vancouver for some years up till 1901, and was the head of one of the best known assaying firms in British Columbia in the late nineties.

Mr. T. A. Rickard, of San Francisco, California, editor of Mining and Scientific Press, has been spending several weeks in British Columbia, and has visited some of the larger mines and reduction works in Kootenay and Boundary districts and the Britannia mine and concentration plant on the coast.

Mr. W. F. Ferrier, of Toronto, and Prof. J. C. Gwillim, of Kingston, were in British Columbia recently, making investigations for the Dominion Government relative to certain minerals concerning the occurrence and development of which information is required. The former had a trying experience on Vancouver Island, for when on the way to visit some mining property owned by Mr. J. D. Pemberton, of Victoria, the latter, who was one of the party of three, died on the trail from heart disease.

The officials at the Granby Consolidated M. S. and P. Co.'s Hidden Creek mine, near Anyox, Observatory Inlet, British Columbia, are as follows: Mine superintendent, E. E. Campbell; assistant superintendent, J. Tuttle; mine engineer, F. E. Patton; mine foreman, J. Swanson; surface foreman, G. L. Fraser; accountant and timekeeper, W. S. Smith. These, with F. Newton, diamond drill, and C. C. Rhodes, are the general committee of the Safety First organization lately organized at the Hidden Creek mine. Mr. Rhodes is secretary of the committee.

Mr. Geo. T. Holloway, Chairman of the Ontario Nickel Commission, has returned to Canada and is now in Toronto.

Mr. Frank McMillan Stanton, of New York, died on Tuesday, September 12th.

Mr. T. W. Gibson visited Sudbury and Cobalt with the Dominion's Royal Commission and has returned to Toronto.

Mr. Geo. Watkin Evans is making his first professional visit into the interior of Alaska since the gold rush of 1897.

Mr. J. W. D. Moodie, of Britannia Beach, near Vancouver, B.C., vice-president and general manager of the Britannia Mining and Smelting Co., was at Tacoma, Puget Sound, Washington, about the end of August.

Mr. W. J. Elmendorf, formerly of Victoria, but for some time past making Seattle, Washington, his headquarters, was in Nevada last month, and will shortly pay another visit to Alaska, going this time to the Copper River district.

Mr. O. B. Perry, of New York City, has gone to Dawson, Yukon, on one of his periodical visits to that part of Canada.

Mr. F. S. Norcross, Jun., of Copper Mountain, Similkameen, B.C., mining superintendent for the British Columbia Copper Co., has been visiting relatives in Michigan.

Mr. J. C. Nichol, superintendent of the Canadian Copper Co., Copper Cliff, and Mr. W. W. Mein, consulting engineer to the Dome mine, left this morning after a business trip to the Dome mine.

Messrs. Arthur Lakes, Jun., mining engineer, of Spokane, and F. R. Skeels, resident manager for the company that lately acquired the Granite-Poorman group of gold mines, situated near Nelson, B.C., recently motored from Spokane to Nelson by way of Rossland and Trail, making the trip in quick time, with only 11 hours and 18 minutes actual travelling time. The railway distance between Spokane and Nelson via Rossland is 202 miles, and the train time, if the journey could be made without the usual delay at Rossland, is 11 hours and 10 minutes, so that quick time was made by the motor party which included Messrs. Lakes and Skeels.

Mr. J. W. Boyle, of Dawson, Yukon, "a dredge king of the Klondike," manager of the Canadian Klondike Mining Co., was in London, England, last month. During his absence from the Yukon his son, J. W. Boyle, Jun., has been in charge of the company's gold-dredging operations on the Boyle concessions, Klondike River.

Prof. H. O. Hofman, of the Massachusetts Institute of Technology, has been visiting a number of lead-smelting works, including several in the Northwest.

Messrs. O. L. Holman and Oscar Pierson, of Spokane, Washington, on August 29, met in Nelson, B.C., Mr. R. D. Fetherstonhaugh, mining engineer, of Edmonton, Alberta, and there discussed with him matters connected with a placer-mining enterprise they are considering undertaking, on the upper Peace River, B.C.

Mr. Raleigh P. Trimble, of Portland, Oregon, who has been for several years actively identified with the development of mining properties on Rocher Dedoule mountain and neighboring parts of Omineca mining division of British Columbia, arrived in Seattle, Washington, at the end of August after having been in a hospital at Prince Rupert, B.C., suffering from an injury to one of his ankles.

Mr. Jules Labarthe, of Bradley, Bruff and Labarthe, metallurgical engineers, San Francisco, California, was in Spokane, Washington, on August 30, on his way from Kellogg, Coeur d'Alene district of Idaho, to Homestead, Oregon, Mr. Labarthe is engineer in charge of construction of the lead smeltery the Bunker Hill & Sullivan Mining Co. is building near Kellogg; for several years he was superintendent of the Consolidated Mining and Smelting Co.'s smelting works at Trail, British Columbia. He is reported to have stated in Spokane that good progress is being made with construction work at the site of the new works near Kellogg, grading and foundations being nearly completed. He expected that structural steel for the smeltery buildings would begin to arive before the middle of September, providing the threatened railway strike did not take place.

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## GOWGANDA.

It is reported that a very important strike has been made at the Miller Lake O'Brien property, Gowganda. This and the Millerette property are owned by M. J. O'Brien, owner of the O'Brien mine at Cobalt.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

Ore receipts at the Consolidated Mining and Smelting Co.'s works at Trail were comparatively large during the period from July 21 to August 21, inclusive, having averaged 1,517 tons a day for the 31 days, which quantity compares with a daily average of 1,349 tons for six months ended June 30 last. The increase was due chiefly to the fact that shipments from the company's Sullivan mine, in East Kootenay, were larger, a record having been made in the week ended August 21 with a total of 4,070 tons for the seven days. Against that increase, though, there was a shortage from Slocan mines, also from mines in the State of Washington, while Ainsworth mines made somewhat larger shipments than in several other recent weeks, and those at Rossland kept their output at about the customary quantity. The quantity of ore reaching Boundary district smelting works is not made public, but it is believed that with the coke supply again up to the ordinary requirements of the reduction plants at Grand Forks and Greenwood, shipments of ore would be about normal.

### East Kootenay.

In the summer of 1915 Mr. J. D. Galloway spent two weeks examining some of the mining properties situated in Fort Steele mining division of East Kootenay, but it was not until nearly a year afterward that the account of his visit was published. The following general notes have been abstracted from the recently-issued Annual Report of the Minister of Mines for 1915. After having mentioned his visit to "the Sullivan mine, the most important lead-zinc mine in British Columbia or Canada," Mr. Galloway continued:

"Other sections visited were Perry and Wild Horse creeks, and claims on Whitefish and other creeks tributary to St. Mary River. Only placer-mining is being done on Wild Horse creek, while on Perry creek, in addition to placer-mining, some very low-grade gold quartz veins, which have been known of for years, have recently again had attention turned to them.

"Copper deposits on the St. Mary River and tributaries have been known for some time, and on some of these a little development has been carried out. The most important are those on Whitefish creek, owned by the Evans Bros., and these were examined by the writer.

"This district was one of the first prospected and best known in the Interior of British Columbia, and hence no extended description is needed here. It is interesting to note that Wild Horse creek was about the first important gold-placer creek worked by the California miners in their northern stampede in the early sixties.

"Notes and reports on the Fort Steele Division may be found in many of the Annual Reports of B.C. Department of Mines. An exhaustive detail report by the Provincial Mineralogist was included in the Report for the year 1898. Dr. S. J. Scholfield, of the Geological Survey of Canada, spent several seasons in working up the geology and physiographic history of the Cranbrook Map-area, the results of his work being published as Memoir No. 76 of the Survey. This work includes a thorough description of the silver-lead-zinc deposits of the Fort Steele Mining Division, together with a full discussion of their probable origin and hints for future prospecting.

For many years past this division has produced a large proportion of the lead output of the Province, but this has come from only a few mines. At first the North Star and St. Eugene mines made practically the whole production, but now these properties are apparently about worked out, the former having been closed for some years, and the latter now making only an insignificant output. While these properties were declining, however, the Sullivan was being developed to such a point that it has since more than kept up the average annual output for the district.

"The yearly value in lead and silver of the ore produced from the Sullivan mine has, during each of the last three years, been more than $1,000,000, and, as in the near future the zinc will also be recovered, which has not been done in the past, the annual value of ore production will soon be materially increased.

"The important coal-mines of the Crowsnest district are situated in the southern part of this division. Descriptions of these mines and details of production and development are fully recorded in each annual report of this department under the heading of 'coal.' The Report previously mentioned, for the year 1898, contains a description of the coalfields, their geological features and early development. In the report for this year, as in previous ones, the Mine Inspectors' reports on these coal-mines will be found near the end of the volume under the heading 'Coal-mining in British Columbia.' In a report on the coal resources of Canada, Vol. II. of the 'Coal Resources of the World,' prepared by Dr. D. B. Dowling for the Twelfth International Geological Congress, and issued by the Geological Survey of Canada, will be found an estimate of the coal potentialities, or probable reserves of coal, in this district.

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"Memoir 69 of the Geological Survey of Canada, also by Dr. Dowling, which is entitled 'Coalfields of British Columbia,' is a compilation of all known reports on British Columbia coal.

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"There are two important towns in the division—Cranbrook, which is a railway divisional point, the centre of a prosperous farming district, and near which logging camps and sawmills are operated on a fairly large scale; and Fernie, which is the centre of the coal-mining industry in the Crowsnest Pass.

"The Crowsnest branch of the Canadian Pacific railway runs trrough the district and now is such an important line as to be regarded as a main trunk line instead of a branch. The Kootenay Central railway from Golden, on the main line of the Canadian Pacific railway, joins the Crowsnest line at Colvalli, 20 miles east of Cranbrook, and links this section with the main transcontinental line of the Canadian Pacific railway.

"The town of Steele (formerly called Fort Steele) is the oldest town in the district and one of the oldest in the interior of the Province. It is not as important now as in former years, as it has been overshadowed and surpassed by its younger rival, Cranbrook, situated 12 miles to the southward and on the main Crowsnest branch of the Canadian Pacific railway.

"In 1915 the mineral production of this division was as follows: Ore shipped, 44,372 tons, yielding 481,258 oz. of silver and 26,582,050 lb. of lead; coal, exclusive of that made into coke, 459,081 long tons; coke, 240,421

long tons; and building materials to the value of $7,000."

### West Kootenay.

**Slocan**—Some time ago arrangements were made for a resumption of work at the Lucky Jim mine under the direction of Mr. A. G. Larson, of Spokane, Washington, who was appointed by the Supreme Court in order to obviate foreclosure at the suit of a mortgagee. The following progress review was lately published in Spokane:

The July report of A. G. Larson, receiver of the Lucky Jim, has been filed with the registrar of the Supreme Court of British Columbia; it sets forth that during July 1,230 tons of ore was treated at the Rosebery mill. Two hundred and fifty tons of concentrate was produced.

Owing to the grade of concentrate, only 60 tons was marketed. One hundred and seventy-five tons of concentrate, being below the grade of zinc and too high in iron to answer smelter requirements, will be retreated before marketing. The remaining 15 tons of concentrate was of marketable grade and was carried over to August shipments.

In addition to shipment of concentrate, some 160 tons of crude ore was sent to the smelter. On account of the increase of lead in the mill ore, a considerable quantity of middling was stored. Some middling was transferred to the Kaslo plant, as the necessary repairs to the magnetic separator will be completed shortly and this middling will then be treated in it. Detailed report as to the product and its analysis will be submitted later after a test has been made. The receiver stated it was expected to make a small tonnage of lead concentrate in August from ore already broken.

Under the present milling performance only 50 per cent. of the zinc content of the mill ore was saved in the form of a marketable product, and the ore shipped contained a high lime content. These reasons, the receiver states, made it advisable to limit the production to an amount which would only meet expenses until the completion of the improvements to the milling facilities, when, it is believed, a considerable increase in saving and the production of a desirable product will be shown. Unavoidable delays, the report states, have prevented the completion of the improvements as soon as expected, but it is thought the plants will be completed by the end of the month.

It was stated that the Kaslo plant would be in operation by September 1. The Canadian Pacific Railway Co. has notified the receiver that payment has been authorized of a refund of past shipments, an amount which has been carried forward in former reports.

Receipts for the month with the amount of $80,324.74 reported to June 30, were $96,194.11. This includes final returns on 19 cars of ore shipped to the Granby Mining and Smelting Co., of St. Louis, Mo., amounting to $10,455.59, and advance on eight cars of $4,000 and by amended returns on four cars of $3.69.

Expenditures made a total of $7,217.77 and include $6,504.88 for mining work and $181.72 for office expenses. The total operating expenses for July were $6,996.60.

Included in the statement of ore delivered to the smelter for which no returns have been received, are 30 tons of concentrate amounting to $1,714.50 and 160 tons of crude ore amounting to $518,840, a total of $6,902.90. The amount due from smelters for ore shipped prior to July 1 is as follows: From Granby Co., $3,234.32; from the Kusa Smelter Company, $2,117.25, and from the Canadian Pacific for freight advance charges to be refunded $2,940; the total amount due being $15,194.47.

### General Notes.

While for several months the reopening of the Tyee Copper Co.'s smelting works at Ladysmith, Vancouver Island, has been hoped for by owners of mining properties in the Coast district, who have been unable to make other arrangements for getting ore smelted, there does not appear to have been anything definite arranged yet. Probably the chief difficulty is that of obtaining a regular and sufficient supply of ore, although the question of converting copper matte also requires consideration, since it is stated that the convertors at the Tacoma smeltery are already being operated to their fullest capacity in converting matte produced there. However, the Tyee Copper Co.'s officials are seeking to overcome obstacles to their works again being operated; meanwhile small shippers of copper ores, or those who would be under favorable conditions have no alternative but to await developments.

The total quantity of ore received at the smelting works at Trail, West Kootenay, during nearly eight months of 1916, to August 21, inclusive, has been 318,214 tons, of which 265,618 tons was from mines operated by the Consolidated Mining and Smelting Co. and 52,596 tons was of custom ores. The total for the corresponding period of 1915 was approximately 40,000 tons less. It is expected that there will be a substantial addition to the increase during the remaining months of the current year.

An open verdict was brought in by a coroner's jury empanelled to investigate the cause of the death of miners who lost their lives in one of the coal mines at Michel, Crowsnest district, Southeast Kootenay, when an explosion took place there in the night of August 9. All available evidence was taken, but there was nothing that the jury considered threw light on the actual cause of the explosion. Seven bodies have been recovered, but at the end of August there were still five men missing, and it is concluded that their bodies are in parts of the mine not yet accessible to those who have been endeavoring to find them.

## SUDBURY DISTRICT

The government has appropriated $4,000 to be used on the new road connecting Sudbury with Copper Cliff. A permanent Tarvia pavement will be put down. Copper Cliff is the smelter town of the Canadian Copper Company. Sudbury and Copper Cliff will appropriate $5,000 each, the total cost of the road being estimated at $14,000.

It is rumored that both the Blezzard and Stobie nickel-copper mines will start operation, but the report cannot as yet be confirmed.

There has been considerable activity along the Soo Branch this week. Mr. S. Smythe of the Nichols Copper Co. of New York, and also of the General Chemical Company, has been visiting the various Copper possibilities in the district. The Company has had two engineers in the district for about two weeks and the same men have been in the field all summer. Visits have been made to the Sable River Copper Co. plant, the Hermina mine, the Shakespeare Gold Mine, Copper claims at Espanola, Copper claims at Wiskey Lake, Kelly Copper Mine, and several other claims.

Mr. H. Bent has been visiting claims at Wiskey Lake.

The Mond Nickel Company and its employees have in the past year contributed about $35,000 to the Patriotic funds.

## NOVA SCOTIA STEEL'S EXHIBIT

A striking exhibit, even among many new things, which the Toronto Exhibition this year brings before the Canadian public is the display of what the Nova Scotia Steel & Coal Company, Limited, of New Glasgow, N.S., is doing to help win the war. Naturally it is shown in the Munitions Building. It stands out there as a tribute of Canadian manufacture and Canadian patriotism.

Prominent in the exhibit is a huge shell stock steel ingot weighing 6,670 pounds. This shows, so to speak, the genesis of the scores of shells in all stages of development, which are the leading feature of the firm's display. These shells run from the comparatively small 18-pounder to the huge eight-inch projectiles which stand when on edge thirty inches high, and are used for high explosives. The 9.2 high explosive shell ready to go into the gun is of a brick-khaki color, and all the scores of parts are shown with the waves which prevent the shell slipping when loaded. Side by side with this is a shrapnel shell in half section exposed to show the 365 bullets they contain, the fuse and the method of detonation. To make these alone takes several hundredweights of metal, while the enormous force of these projectiles is not in any part of the Exhibition better brought out than in the exhibit of the Nova Scotian firm.

There are also samples of ore and of dolomite and limestone flux, besides some of the celebrated Nova Scotian coal from the main seam of the mines which the company has in Cape Breton. The blast furnaces of this company and the head offices are at New Glasgow, N.S., the coal mines at Sydney Mines, C.B., and the iron mines at Wabana, Newfoundland.

"Scotia" manufactures have stood for so long high in the history of Canada that many people will be surprised to know that the development of the firm is something which did not begin until after Confederation. In 1872, it appears, only eight men were employed at the old works in New Glasgow. In its wonderful strides since then the Nova Scotia Steel & Coal Company, Limited, can be compared most nearly with the big Krupp firm in Essen, only they have a cleaner business record than that favored by the Kaiser. The capital and funded debt of the company to-day exceeds $18,000,000, and it employs more than 5,000 men. New Glasgow and Sydney Mines were of course made by the settlement there of the business.

The Nova Scotia Steel Company, Limited, were the pioneer manufacturers of steel in Canada, and when the purchase of an existing coal company was effected in 1900 the present title was adopted and the firm commenced the making of steel from not only its own ore, but with its own coal. The saving can be imagined. Iron ore deposits were acquired in Bell Island and Conception Bay, and the new port of Wabana was soon a busy place. The estimated contents of the seams, over four feet thick, owned by the firm is put at 2,379,500,000 tons, something too big for the average conception. These areas cover over eighty square miles of land. The output of coal in 1915 was 610,000 tons. This had grown from 243,000 tons in 1900. A feature of the coal is that for metallurgical and general purposes it is one of the best in the world, and it is worth while noting among the many patriotic efforts in Canada since war broke out that this coal has been given a naval test by the Admiralty, the results of which have so far not been given to the world.

Perhaps the best summary of the activities of the Nova Scotia Steel & Coal Company, Limited, is given as follows:—(1) Coal mines at Sydney, N.S.; (2) Iron ore mines at Wabana, Newfoundland; (3) Blast furnaces and smelting works at Sydney Mines; (4) Engineering works at New Glasgow, N.S.; (5) Car works at New Glasgow.

At one of the annual meetings, the President was able to state that the Newfoundland deposits were being regarded both in Great Britain and in the United States as the most important in the world. In the matter of tonnage owned the company has a larger quantity than the United States Steel Corporation, and the supply is calculated to be enough to last for the enormous term of 3,000 years. An interim report filed by the Dominions Royal Commission—their work was interrupted by the outbreak of war, it will be remembered—states that the Newfoundland hematite deposits, which are practically controlled by the company, are of immense potential importance in the world industries.

These facts are give only to indicate the great size of the company, whose showing of munitions is so prominent in the Canadian National Exhibition this year. The Nova Scotia Steel & Coal Company, Limited, was the very first of the Dominion firms to undertake the supply of shells for this war—a valuable contribution, which shows no sign of diminution. Lest it should be thought that this is only a war activity, it may be mentioned that the year 1913 saw the blast furnaces of the Dominion turn out 1,048,538 tons of steel ingots. What is before this firm, therefore, in the swinging development which is expected on the declaration of peace, can only be guessed at.—The Globe, Toronto.

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A School of Mining has been organized in connection with the Calgary Institute of Technology. Mr. W. A. Davidson, M.E., M.Sc., has been appointed head of the mining department. He is a graduate of McGill University and has had practical experience in connection with coal mining in Nova Scotia and Alberta, and occupied the position of mine manager for the International Coal and Coke Co., of Spokane, Washington, operating coal mines and coke ovens at Coleman, Alberta. He will undertake the organization of technical instruction in mining through the medium of classes in the mining centres of the Province.

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### COPPER MOUNTAIN.

After four years of diamond drilling on Copper Mountain, in Similkameen district of British Columbia, mine development is in progress. Several tunnels at different levels are to be driven. Power for initial development work is being obtained from the B. C. Portland Cement Co.'s works, 14 miles from Copper Mountain. Current is transformed to 15,000 volts and transmitted to Copper Mountain over a temporary high-tension line of No. 4 galvanized fence-wire; at the mine it is stepped down to 2,200 volts. Compressor plant consists of a Canadian Rand two-stage 10-drill compressor, belt-connected to a 150-h.p. motor, and a Chicago pneumatic 6-drill compressor, belt-connected to a 100-h.p. motor; also a Leyner drill sharpener. The first tunnel, dimensions 9 by 10 ft., was started on the 3945 level; it is now in more than 500 ft., and progress is at the rate of 18 ft. a day.

## MINING IN THE YUKON.

A press despatch states that Hon. Dr. Roche, Minister of the Interior for Canada, who at the end of August returned to Ottawa from a visit to the Peace River district of Alberta, British Columbia and Yukon Territory, has stated that mining operations are brisk in the Yukon, where the larger gold companies are busy, and that copper mining has been much stimulated as a result of the European war, the output of copper being heavy, with ore-smelting being done in northern British Columbia. In the Peace River district crops are very good and the country is being fast opened up by the Edmonton, Dunvegan & Peace River Railway, which has been built westward as far as the British Columbia boundary. Settlers are going into the district rapidly and much new land is being occupied.

## AMERICAN CAPITAL IN B. C. MINES.

North-west Mining Truth, published in Spokane, Washington, on the 1st inst. said, editorially: "Mining Truth is delighted to record the fact that the Hon. Lorne A. Campbell, Minister of Mines for British Columbia, has accepted the challenge thrown down by his political opponents and is forcibly reiterating statements made in this city some weeks ago. It will be remembered that he announced at a private dinner party in his honor that the mining industry in British Columbia was looking to Americans to aid in the development of its great opportunities. This was seized upon by the press of opposite political faith as campaign munition, and with due distortion and ungenerous misstatement the attacks were carried to lengths that certainly reflect no credit upon those who directed them. In a recent speech at Slocan, Mr. Campbell pointed to the fact that of twenty-two mines then in operation in the Slocan district, no less than seventeen were financed by American capital and managed by citizens of this country. He also called attention to the very evident fact that Americans have always taken a leading part in the development of other districts of the province. He again expressed his intention of seeking capital wherever it might be found, and said that American centres offered the best avenue to that end. Mr. Campbell might have crawfished in approved political style. He has not. His attitude will lose him no friends among mining men of this country or that which he now so ably serves. Mining men are almost invariably broadminded. Petty political methods do not appeal to them. They admire force, directness and aggression."

## TO MANUFACTURE SAND BRICK.

Galt, Sept. 6.—For the purpose of manufacturing sand brick by a new process, an invention of John T. Jackson of Toronto, the Dominion Building Products, Limited, has been organized, with Dr. David D. Williams, 263 Christie street, Toronto, President; W. J. Heron, Galt, Vice-President; and John T. Jackson, Managing Director. Vice-President Heron announced to-day that the erection of a plant in Galt will be commenced in a few weeks, and other plants will be established at Toronto, Sarnia, Owen Sound, Sudbury and Picton. The headquarters of the concern will be at Galt, where almost unlimited quantities of suitable sand are obtainable on a farm owned by F. S. Scott, M.P., on the northern outskirts of the city. Each plant will have a capacity of 190,000 bricks per day.

## TRETHEWEY.

A circular to shareholders states that operations since their resumption have resulted in profits of about $5,000 for June, $9,500 for July, and $6,800 for the first half of August. The directors state, however, that these profits are due to the fact that a body of high-grade milling ore was opened up at the junction of B and C stopes, and that such profits cannot be expected to continue. The directors further state that in their opinion the proposed sale of the Trethewey property to the Northern Customs Concentrators, Limited, for a price of $125,000 is a favorable one for the company.

## QUEBEC MINES BUSY.

The asbestos, copper-sulphur ore, magnesite and chromite mines of Quebec are making a good record this year. There has been a good demand for asbestos, especially for long fibre, and the price for the best grades is exceptionally high. The Eustis and Weedon mines shipping copper bearing pyrite have profited by the good demand for copper and pyrite. The demand for Canadian chromite and magnesite continues good on account of the cost of ocean freights. The Notre Dame des Agnes zinc property will soon be equipped with a 200-ton concentrator, the construction being well under way.

## THE WAR LOAN.

Ottawa, Sept. 11.—The Minister of Finance to-day handed to the press the following announcement: The second Canadian war loan is now being offered for public subscription. While the Government is aware that Canadian patriotic sentiment alone could be depended upon to ensure success, strict regard has been had in fixing the terms of the issue to prevailing financial conditions, with the object of making the offering attractive from the purely investment standpoint. The Government is confident that this, the second loan for the purpose of raising funds for Canada's war expenditures, will meet with the same loyal and general response which made the first war loan so strikingly successful.

## FLOTATION AT COBALT.

The Buffalo flotation plant at Cobalt, designed to recover silver from mill tailings, is now in operation. The Buffalo has piled a large tonnage of sands during the past few years and these will now be treated. In addition tails from the mill will be treated at the rate of about 100 tons per day, the total tonnage being about 600 tons per day.

## SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| August 22 | 66¼ | 31 9/16 |
| " 23 | 66⅜ | 31⅝ |
| " 24 | 66⅜ | 31⅝ |
| " 25 | 66¼ | 31 9/16 |
| " 26 | 66⅛ | 31½ |
| Sept. 1 | 68⅛ | 32 7/16 |
| " 2 | 67¾ | 32¼ |
| " 4 | Holiday | 32⅛ |
| " 5 | 68 | 32⅜ |
| " 6 | 68½ | 32½ |
| " 7 | 67⅞ | 32 5/16 |
| " 8 | 68¼ | 32½ |

# MARKETS

## TORONTO MARKETS.

Sept. 11—(Quotations from Canada Metal Co., Toronto)—
Spelter, 12½ cents per lb.
Lead, 8¾ cents per lb.
Tin, 44 cents per lb.
Antimony, 18 cents per lb.
Copper, casting, 28½ cents per lb.
Electrolytic, 30 cents per lb.
Ingot brass, yellow, 17 cents; red, 20 cents per lb.
Sept. 11—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $8.50 per ton.
Coal, bituminous, $5.60 per ton.

## NEW YORK MARKETS.

Sept. 8, 1916—Connellsville Coke—
Furnace, spot, $2.80 to $2.90.
Furnace, contract, $2.50 to $2.75.
Foundry, prompt, $3.25 to $3.50.
Foundry, contract, $3.25 to $3.50.
Straits tin, f.o.b., 38.62½ cents.
Copper—
Prime Lake, nominal, 27.25 to 27.75 cents.
Electrolytic, nominal, 27.87½ to 28.12½ cents.
Casting, nominal, 25.25 to 25.50 cents.
Lead, Trust price, 6.50 cents.
Lead, outside, 6.60 cents.
Spelter, prompt western shipments, 8.80 to 9.05 cents.
Antimony—
Chinese and Japanese, 12.00 cents.
American, nominal.
Aluminum—nominal—
No. 1 Virgin, 98-99 per cent., 60.00 to 62.00 cents.
Pure, 98-99 per cent. remelt, 58.00 to 60.00 cents.
No. 12 alloy remelt, 46.00 to 48.00 cents.
Powdered aluminum, $1.00 to $1.15.
Metallic magnesium, 99 per cent. plus, $3.50 to $3.75.
Nickel, 45.00 to 50.00 cents.
Cadmium, nominal, $1.25 to $1.50.
Quicksilver, nominal, $76.00.
Platinum, nominal, $60.00.
Cobalt (metallic), $1.25.
Silver (official), 68¼ cents.
Metal Products.—Following base prices are all f.o.b. mill, but prices are purely nominal:
Sheet copper, hot rolled, 37.50 cents.
Sheet copper, cold rolled, 38.50 cents.
Copper wire, nominal, 33.00 cents.
Copper wire, nominal, October, 31.75 cents.
High sheet brass, 38.00 to 39.00 cents.
Seamless brass tubing, 44.00 to 45.00 cents.
Seamless copper tubing, 44.50 to 45.50 cents.
Brazed brass tubing, 45.50 to 46.50 cents.
Brass wire, 38.00 to 39.00 cents.
Brass rods, 38.00 to 39.00 cents.
Sheet zinc, f.o.b. smelter, 15.00 cents.

## MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% $MoS_2$, $13.00 per unit.
Ores carrying between 3% and 5% $MoS_2$, $14.50 per unit.
Ores carrying between 5% and 10% $MoS_2$, $16.00 per unit.
Ores carrying between 10% and 15% $MoS_2$, $17.00 per unit.
Ores carrying between 15% and 20% $MoS_2$, $18.00 per unit.
80% concentrates $1.00 lb. of $MoS_2$.
Penalties imposed for copper and bismuth.
No settlement made for any molybdic oxide in ores.
Settlement ten days after sampling.
Samples of ores to be submitted before any shipment made.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto.)
As of close September 8th, 1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Atlantic Steel | 55.00 | 62.50 |
| Canada Car | 38.00 | 41.00 |
| Curtiss Aeroplane | 10.00 | 25.00 |
| Can. Copper | 1.50 | 1.75 |
| Cambria Steel | 81.00 | 82.00 |
| Canada Cement | 61.00 | 62.00 |
| Howe Sound | 5.25 | 5.50 |
| International Nickel (New) | 43.75 | 43.87 |
| Steel of Canada | 61.50 | 62.50 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex | .08½ | .08¾ |
| Dome Extension | .36 | .36¼ |
| Dome Lake | .44½ | .45 |
| Dome Mines | .24¼ | ... |
| Foley O'Brien | .55 | ... |
| Hollinger | 6.99 | 7.00 |
| Jupiter | .31½ | .32 |
| McIntyre | 1.52 | 1.53 |
| McIntyre Extension | .45½ | .46 |
| Moneta | .15½ | .16½ |
| Plenaurium | .60 | .70 |
| Porcupine Crown | .76 | .77 |
| Porcupine Imperial | .02 | .03 |
| Porcupine Tisdale | .01⅝ | .02 |
| Porcupine Vipond | .38 | .39 |
| Preston East Dome | .04¾ | .05 |
| Rea | .65 | .67 |
| Teck Hughes | .39½ | .39¾ |
| West Dome | .38¾ | .39 |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac | .20 | ... |
| Bailey | .08⅜ | .08¾ |
| Beaver | .41½ | .42 |
| Buffalo | .75 | 1.05 |
| Chambers Ferland | .19 | .20 |
| Coniagas | 4.55 | 5.00 |
| Crown Reserve | .40 | .47 |
| Foster | .05 | .07½ |
| Gifford | .06½ | .06¾ |
| Gould | .00¼ | .00⅜ |
| Great Northern | .04¾ | .05 |
| Hargreaves | .03 | .03½ |
| Hudson Bay | .60 | ... |
| Kerr Lake | ... | 4.75 |
| La Rose | .60 | .65 |
| McKinley | .59 | .61 |
| Nipissing | 7.35 | 7.40 |
| Ophir | .09 | .09½ |
| Peterson Lake | .21½ | .22 |
| Right of Way | .05 | .06 |
| Seneca Superior | .26 | .30 |
| Shamrock Cons. | .10 | .10½ |
| Silver Leaf | .07⅞ | .02 |
| Temiskaming | .60½ | .61½ |
| Trethewey | .18 | .18½ |
| Wettlaufer | .13 | .15 |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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## Canadian Miner's Buying Directory.—(Continued from page 14.)

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## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 2
Armstrong, Whitworth of Can., Ltd. . . . . 10

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
M. Beatty & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
C. L. Berger & Sons . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd. . . . . 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co. . . . . 6
Canadian Explosives, Ltd. . . . . 5
Can. Ingersoll-Rand Co., Ltd.... 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. . . . . 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . Outside Back Cover

D

Dept. of Mines, Canada. . . . . Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion of Canada, War Loan.. 3
Dominion Coal Co., Ltd. . . . . 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fraser & Chalmers of Can. Ltd. 4
Fuller, A. S. & Co. . . . . 12

G

Jno. J. Gartshore . . . . . 12
B. Greening Wire Co.....front cover

H

Hassan, A. A. . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11

I

Imperial Bank of Canada . . . . . 6
Industrial & Technical Press. . . . . outside back cover
International Molybdenum Co.... 16
International Nickel Co. . . . . 6

J

Johnson, Matthey & Co. . . . . 11
Jones & Glassco . . . . . 10

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

MacKinnon, Holmes & Co. . . . . 16
Murphy, Chas. J. . . . . 11
Mussens, Ltd. . . . . 10

N

New Ontario Oil & Gas Co. . . . . 9
Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

O

Ontario, Province of . . . . . Inside Back Cover

P

Pacific Coast Pipe Co., Ltd. .... 9

Q

Quebec, Province of . . . . . 8

S

School of Mining . . . . . 16
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 12
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2
Summerhayes, Maurice W. . . . . 11

T

Tyrrell, J. B. . . . . 11

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The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

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Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 78. Wabana Iron Ore of Newfoundland, by A. O. Hayes.

Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Map 59A. Wheaton, Yukon Territory.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 160A. Manaimo Sheet, Vancouver Island.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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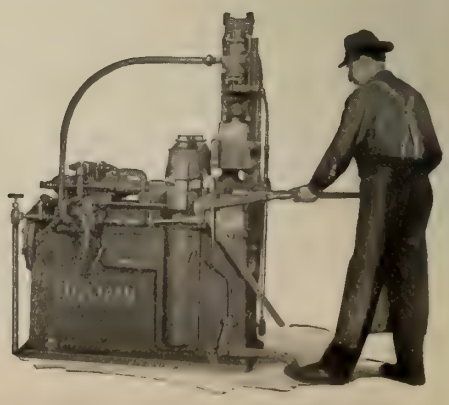
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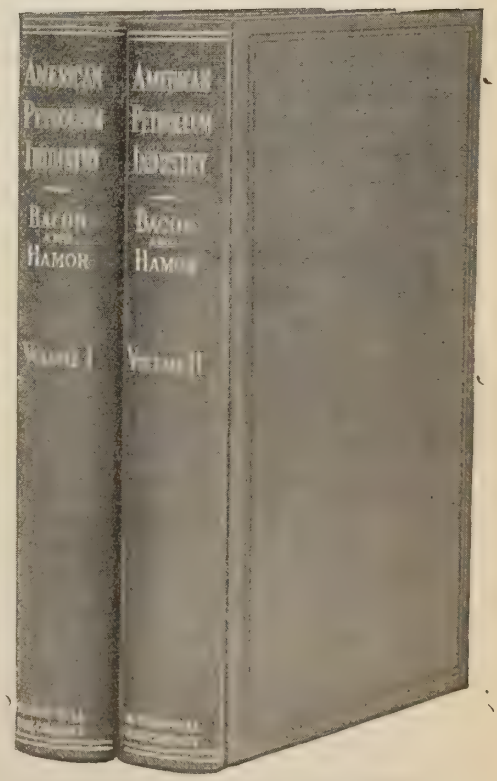
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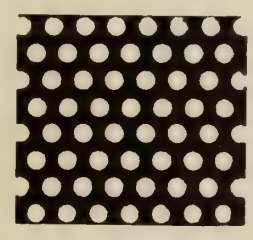
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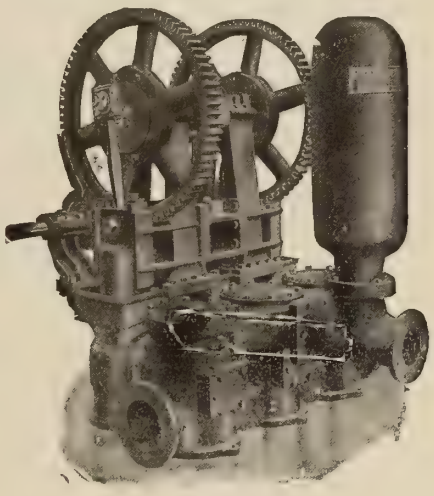
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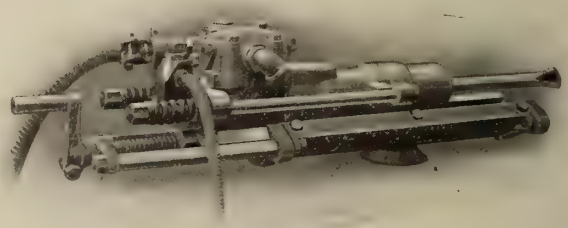
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, October 1, 1916. No. 19

## The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

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*Editor*

REGINALD E. HORE

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CIRCULATION

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CONTENTS

| Editorials— | Page |
|---|---|
| Nickel Fiction | 455 |
| Our Industrial Resources | 455 |
| Molybdenite | 455 |
| Increased Production of Metals | 456 |
| That Blacklist | 456 |
| Reports for Investors | 457 |
| Safety First vs. "Is It Safe?" By F. W. Gray | 459 |
| The Industrial Problem | 460 |
| The Concentration of Molybdenite by Flotation | 461 |
| Canada's Water Powers | 462 |
| The Arctic Expedition | 463 |
| The Herb Lake Gold District. By R. C. Wallace | 466 |
| Ontario's Metal Production. By T. W. Gibson | 467 |
| Sulphide Deposits at Flin-Flon and Schist Lakes, Manitoba | 468 |
| Arizona Meeting A. I. M. E. | 470 |
| Book Reviews | 473 |
| Personal and General | 474 |
| Special Correspondence | 475 |
| Markets | 478 |

## NICKEL FICTION

In our last issue we called attention to the absurdly low valuation placed on nickel matte in the reports of the Department of Trade and Commerce. We suggested that the Department must be publishing figures handed to it, rather than figures which could be relied upon as the result of careful enquiry by the Department. Our assumption seems to have been correct, for we are advised that the figures are in fact not collected by the Department. Perhaps the Customs Department can explain why nickel matte exported from Canada is not given a value that is approximately correct.

The statement that a quantity of nickel matte is worth $1,779,801 should properly be interpreted to mean that the value has been carefully worked out and is accurate to the last dollar. Otherwise we would expect round numbers to be used. The repeated use of absurd valuations is not creditable to any department.

## OUR INDUSTRIAL RESOURCES

In a leaflet published and distributed by the Department of Trade and Commerce we find the following:

"The power of a nation is the producing power of her industries. Canada must find out what this producing power is and then develop it. The capacity of every plant must be gauged. The ability of every man must be known.

"A nation's prosperity is mechanical; it is electrical; it is chemical; it is mining, manufacturing, transportation; it is every phase of Engineering.

"Canada must survey its industrial resources. The channels of commerce must be charted. Each source of supply must be sounded."

The Department of Trade and Commerce is making a praiseworthy effort to help Canada's industries. It is to be hoped that the mining industry will be well represented at the National Business Conference to be held this fall at the instance of the Right. Hon. Sir George Foster. His department can do a great deal of good if it receives proper support. If our resources are to be used to greatest advantage, we must know what they are. The Department of Trade and Commerce wants information which can be used to further the interests of Canada. Can you help? Can you supply useful information? Will you do it?

## MOLYBDENITE

Molybdenite has come into great prominence on account of the war, and it seems likely that Canada is to become an important producer of molybdenum and its

compounds. On another page will be found some account of the concentrating plant recently put into operation at Renfrew. That plant is treating ore from eastern Ontario mines and has recently received a shipment of rich ore from Amos, Quebec. We are advised that great progress has been made at Quyon by the Canadian Wood Co., which is now shipping 250 to 300 tons of ore per week. Out in British Columbia some excellent ore has been developed at the Molly mine. At Orillia molybdic acid and ammonium molybdate are being produced, and preparations are being made for producing ferro-molybdenum in large quantities.

## INCREASED PRODUCTION OF METALS

On another page will be found the Bureau of Mines report on production of Ontario's metalliferous mines for the first six months of 1916. This shows an increase in all items except iron ore. The production of silver was considerably smaller, but the value much greater. Large increases in production of gold, nickel and copper are the most notable items. Both in amount and in value these metals show increase of over 30 per cent. The demand for iron and steel is well illustrated by the larger output and higher price of pig iron from Ontario smelters.

## THAT BLACKLIST

We are still without a blacklist of enemy firms; but there are some indications of activity in official circles. "Monetary Times," which has advocated that something be done, says:

"Attention has been called in these columns to the fact that a blacklist of enemy firms has not been established in Canada. It will be recollected that more than two months ago the British Government established a blacklist of United States firms with which citizens of the United Kingdom were forbidden to trade. Much unfavorable comment has been heard because Canada, as yet, has failed to follow the example. As it is illegal and undesirable for citizens of Great Britain to trade with these enemy firms, it is equally undesirable for Canadians to trade with them. The attention of the authorities at Ottawa has been called to this matter, and it is pleasing to know that they are giving it consideration. It is scarcely too much to hope and anticipate that the Dominion, as a unit of the British Empire, will fall into line in this important matter, as it has done in others."

## REPORTS FOR INVESTORS

Frequently it happens that an engineer is called upon to examine for prospective purchasers a property in a district with which he is unfamiliar. He gathers information from any available source, visits the property and samples carefully the deposits to which his attention is directed. He examines also all nearby outcrops and endeavors to interpret the structure. If there are workings on neighboring properties, he visits these and gathers what he can from the experience of those who have operated in the district. Then with his notes, maps and samples he returns. When the samples have been assayed and studied in conjunction with the information already gathered, the engineer forms some opinion of the value of the property. He cannot tell just how much the property is worth, for he has not sufficient information. Having exhausted available sources of information, however, he must decide whether his clients are or are not warranted in paying the price asked. To many clients the most satisfactory answer is "yes" or "no." Some clients, however, want a detailed report, parts of which they understand and other parts of which they do not understand, but which are frequently of value when interpreted by other engineers.

Many engineers, when asked to write out a detailed report find difficulty in confining their attention to what they themselves consider the important facts. The value of the ore in sight, the probable extent of the deposit, the cost of mining, treating and marketing, and other such important matters, are in some reports not properly emphasized, while geography and geology are dwelt on to an extent which indicates that failure to make observations in the field has resulted in liberal clippings from printed geological reports.

When properly used, geological reports are of considerable value to the mine operator. Detailed studies of structure of the ore deposits are particularly useful, and, together with the results of careful sampling, are of vital importance. That geological descriptions are, however, misused by those who write reports is indicated by the following clipping sent to us by Prof. A. C. Lane, of Tufts College, Mass. Our readers will agree that Mr. Newkirk's criticism is just. If he had to depend on that geological description to reach a decision, it is no wonder that he protests.

### A Porcupine Mining Report.

"The formation of the Porcupine belt is largely of volcanic origin. The igneous Keewatins predominate and are much schisted. Associated with them are the rusty carbonates, characteristic of the gold-bearing districts of northern Ontario. Conglomerates frequently overlay the igneous rocks, with pillow lava intrusive in the conglomerate. The sedimentaries are also markedly schistose. Quartz-porphyry is intrusive. Serpentine occurs in large volume."

The above is from a report on an Ontario gold mine just received by the writer.

I have been awaiting the report on this mine with ill-concealed and eager impatience, yet now that it has arrived and I have read it over several times I hardly know what to do about it.

Pending the arrival of this report, I told myself confidentially that if the report proved to be promising I would invest a few thousand dollars in this district. Having perused the report until mental collapse threatens, I must confess I am up in the air on the proposition.

I hate to find fault, and yet I am frank to say the above mining report does not suit me. I work other people hard to earn my money, and I don't propose to fritter it away in any mining proposition that is in a condition such as the above one seems to be.

In the first place, the report states that the Porcupine belt is largely of volcanic origin. I do not object to that—in fact, I would not ask to have the volcanic

origin changed on my account at all, but I hate like everything to see the "igneous keewatins predominate." Who are "igneous keewatins," anyhow, that they always seek to predominate over everything? They ought to be taught their place in a mining report. Not only that, but they are "schisted"—this report admits it. Fancy a foxy mining investor like myself, for instance, investing his money in "igneous keewatins" broken out all over with schists!

The "rusty carbonates" are all right, too. I naturally expected a few of those, and I don't think they do any particular harm unless they get too rusty; but this can be prevented by rubbing them with an oiled rag now and then.

As for the "conglomerates," they should not militate against operating this mine, nor dilute the richness of the gold-bearing quartz—provided the mine owners put in an up-to-date conglomerator to handle 'em. At least, that is my opinion, and with my wide knowledge of mining interests it ought to be worth something.

I am free to state that the above report presented an unsurmountable objection to me until I read down to that portion of it which states:

"The sedimentaries are also markedly schistose."

Right there is where I began to lose an investing interest in this mine. What can be done, I ask, when the "sedimentaries are markedly schistose"? Absolutely nothing can be done! You just have to sit back and let 'em remain so; that is all. Mining experts have tried to cope with this sad state of affairs, but they have always failed ignominiously. Now, if it were the alimentaries instead of the "sedimentaries" that were affected in this deplorable manner, something might possibly be done about it; but when a "markedly schistose" fastens on to a "sedimentary"—good night!

N. N.

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## MINING MACHINERY WANTED BY RUSSIANS.

With reference to mining machinery needed for the Ural Gold Mining industries (Weekly Bulletin No. 657), the British Board of Trade Journal states that the Board of Trade have received information to the effect that the official Bulletin of Laws of Petrograd of June 28/July 11 publishes a decree of the Minister of Commerce, dated June 22/July 5, giving a list (as follows) of the machines, apparatus, appliances, etc., which are to be admitted, for a period of ten years, free of customs duties, for the requirements of the Siberian and Ural gold mining industries, in accordance with the Imperial Decree of 13th/26th May, 1916:—

1. Dredges complete with all machines, boilers, engines, pontoons and accessories, fitted together or otherwise according to specifications furnished by the sellers or by the works constructing the machines, apparatus, accessories, and their parts.

2. In dredges driven by electricity: dynamos, electric motors with cables and distributing arrangements; protecting and measuring appliances; transformers; electric stations, to be placed on the river bank or in barges and developing power for the engines on the dredge; all steam engines, boilers, motors at the station, electric generators, power conducting apparatus, and in general everything necessary for the fitting up of the station.

3. Parts of dredges (clause 1), whether imported with them or separately, viz.: (a) pontoon parts, steel, iron, or wooden, viz.: steel and iron sheets, iron assorted, sheared, drilled or punched; pile supports, slippers for them, frames, bolts, etc.; the bucket lead with all appurtenances, viz.: brackets, beams, rollers, bucket chain line, scoops, scoop bolts, and steel and iron lips for buckets and ropes, rubber belts, upper and lower drums, bearing blocks, pinion wheels and bearings, hoist of the upper drum, hoisting mechanism of the bucket lead (winch, tooth gearing); (b) parts of the washing apparatus: trommels with friction gearing, gold-catching tables and sluices, screens for them, discharging bin, spraying pipe, steel sheet screens; trommel fittings, including rollers and tooth gearing; (c) parts of tailings discharge apparatus: 2 gravel and sand conveyers, gravel elevators, hoists for conveyers; (d) parts for dredging control: main hoisting gear pertaining to the set of trommels and cables, piles, admission gear rods, steel ropes, foundation plates and bolts; (e) parts of dredge adjuncts: pumps, pipes, valves, hoists, belting, accessories for heating and fire service appliances; (f) parts of electrical equipment for electrical dredges: electric stations on the bank or on a special barge for serving the dredge (engines, dynamo-engines, switchboards, protecting and measuring appliances, transformers, cables, electro-motors); (g) parts of the steam dredge; steam boilers, engines, condensers, and driving gear.

4. Excavators complete with all machines, boilers, mechanism, washing arrangements, electro-locomotives, steam locomotives and appliances for removing turf and overburden, except rails and trucks, according to the specifications furnished by the sellers or works constructing the excavators.

5. Parts of the above (clause 4), whether imported with the machines or apparatus or separately, viz.: buckets, bosses, bolts, drums, chains, steel lips for buckets, washing and catching apparatus, electro-locomotives, etc.; parts of boilers, engines, motors and electro-locomotives on the excavators.

6. Appurtenances and mechanism for prospecting dredging areas: all kinds of drilling apparatus—steam, electrical, hand, animal power—with all accessories; drill hole piping, sleeves, drilling bits, sand suction pumps, slippers, ropes and pulleys, according to specifications furnished by the sellers or works.

7. Parts of the above (clause 6), imported separately or otherwise, viz.: drill hole piping, sleeves, drilling bits, sand suction pumps, nuts, slippers, keys, ropes, pulleys, four-wheeled drill carriages, headframes, winches, hand and all other, with their accessories; counterbalances with pulleys, steam engines driving the drilling and winch mechanism, steam boilers, electromotors, rheostats, dynamos.

8. Apparatus, appliances, machines and mechanism for crushing gold ores and for extracting from them gold by chemical processes, viz.: crushers, rolls, Chilian mills, stamps, mortar boxes, screens, transporters for hoisting ore, automatic feeders, metallic and other appliances for catching gold, sand pumps, cyanide solutions; tubular, spherical and other mills; feeders for passing ore and semi-products to the crushing and extracting appliances; levellers, classifiers, with all their accessories; metal vats and bins for collecting slime and solutions, filter presses with their filter frames and fittings; vacuum filters and agitators with their fittings, air compressors for agitating slime, vacuum pumps, air receivers, mechanical mixers, piping and connecting parts and fittings and bolts; motors for driving the above appliances; appurtenances for smelting residues and for cleansing gold.

9. Parts of apparatus, appliances, machines and mechanism for crushing gold ores and for extracting gold by chemical processes (clause 8), whether im-

ported with the above or separately, viz.: bushing, wearing plates, gold-catching apparatus, fittings, pipes, flanges with connecting parts, dies, tires, mill runners, shafts, cams, tooth wheels, valves, filter frames, belting and cocoanut matting.

10. The machines, apparatus, appurtenances and parts mentioned in this list are admitted duty-free according to the regulations of the 15th/28th June, 1916, for the duty-free admission of dredges and excavators imported for the Siberian and Ural gold-mining industries.

## AN UNSUITABLE SITE.

Mr. R. W. Leonard, commenting on the site of the proposed nickel refinery, says in the Bulletin of the Canadian Mining Institute: "Every British subject who has considered the subject will probably agree that the supply of such an essential element in war munitions as nickel, and so vital to the safety of the Empire, should not be dependent upon refineries located in foreign countries, and, therefore, it is better to have a refinery established in British territory. Again, every intelligent person will agree that such a refinery should be established in a safe part of the Empire where it could not easily be damaged or destroyed by a possible enemy either acting as a nation, or by possible raiders from a neutral country. The newspapers report that the International Nickel Co. have selected Port Colborne, Ontario, as a site for a refinery to manufacture nickel for the British Empire. Port Colborne is on the shore of Lake Erie at the south end of the Welland canal. It is within long range gun fire of United States territory, and especially vulnerable from Lake Erie, which here forms part of the international boundary, and,of course, equally vulnerable to bombs dropped from dirigibles, aeroplanes or hydroplanes, and most accessible to raiders over the border."

## GRANBY.

Spokane, Wash., Sept. 10.—The Granby Mining, Smelting & Power company, with mines in different parts of Alaska and British Columbia, together with immense copper smelters at Anyox and Grand Forks, B. C., is producing an average of 4,000,000 lb. of blister copper monthly, according to Frank M. Sylvester, of Vancouver, B. C., general manager, who is in Spokane conferring with local stockholders. He states that all difficulties of a mining and metallurgical nature that hampered operations at the Anyox smelter and Hidden Creek mines during the first year or so that they were in production have been overcome, and conditions now are satisfactory in every way.

"In pursuance of the company's policy of expansion, which contemplates the Anyox smelter and the Hidden Creek mines as the nucleus of an immense industry, we always are on the lookout for promising new properties, and in the last year we have had not less than 100 examined by our engineers," said Mr. Sylvester. "Of our newer properties two now are on a substantial producing basis. The Midas mine at Valdez, Alaska, is shipping to the smelter at Anyox between 3,000 and 4,000 tons of ore monthly. The Mamie mine on Prince of Wales island, also in Alaska, is shipping between 4,000 and 5,000 tons monthly. A number of others are producing on a smaller scale. We are able to get this tonnage moved because through a subsidiary company we own and operate our own fleet of steamers.

"The Grand Forks plant put its seventh furnace into operation on Thursday, September 7th. As the Crow's Nest Pass Coal company now seems to have overcome its labor troubles and to be in a position to keep us supplied with coke, I anticipate that we shall soon have the eighth furnace blown in and be running at full capacity once more."

**Rossland**—The London office of the Le Roi No. 2, Ltd., has sent out the following report, received there from the company's managers at Rossland: Josie Mine Report for July: Shipped to Trail, 1,404 tons of ore. The receipts from the smeltery are $15,252, being payment for 1,114 tons of ore shipped; sundry receipts, $65; total $15,317. Estimated working costs for the corresponding period were $7,000 for ore production; other expenditures were $20 on capital account and $6,000 on development (including diamond drilling); total expenditures, $13,020.

The total quantity of ore received at the Consolidated M. & S. Co.'s smelting works at Trail from Rossland mines during eight months to September 1st, 1916, has been 227,954 tons, by far the greater part for the company's Centre-Star-War Eagle and Le Roi mines, as follows: Centre Star group, $125,605 tons; Le Roi, 91,247 tons; Le Roi No. 2 Co.'s Josie group, 11,031 tons, and Velvet, 71 tons.

## THE SILVER BULLET.

"Monetary Times" commenting on the war loan says under date of Sept. 22:

"Canada's second war loan of $100,000,000 has been well oversubscribed. The subscriptions range from $100 to $5,000,000, representing investors large and small who have decided that by lending their money to their country, they are helping to bring peace nearer. As an investment, the Canadian war bond is the best in Canada. It is one of the best bonds to be bought anywhere. Behind it is a fertile country of great natural resources and possibilities of expansion. Behind it is the British navy, still mistress of the seas, considerate to neutrals, firm with enemies. Behind it are the men, the money and the determination to bring the war to a successful conclusion, for right and civilization.

"The oversubscription of the first war loan issued in Canada in November last was, as we then said, a well-made silver bullet in the hide of Prussian militarism, autocracy and barbarism. The oversubscription of the present loan is another such bullet. Canada is willing to manufacture these bullets until peace is brought to the Empire and its Allies. The success of the loan is a further indication of our resolve to fight the war to a conclusive finish. It is one of a hundred similar incidents occurring every day in the Motherland and in the outposts of the Empire.

"While Germany is making frantic efforts to have its fifth war loan subscribed, with the future dark and foreboding, defeat looming in the distance, the British Empire is raising, with comparative ease, hundreds of millions for the conduct of the war. The silver bullet is scoring heavily. The material at hand for its making is still sufficient to give the Hun an additional shiver."

## COPPER PRICES

The demand for copper continues. It is reported that two of the largest American producers have made sales for several months ahead at about 27 cents per lb. Britain and her allies are paying good prices for American copper. We are advised, however, that Germany has to pay 80 to 90 cents per pound for what she can secure in Norway.

# "SAFETY FIRST" VS. "IS IT SAFE?"

By F. W. Gray.

English newspapers announce that the much-advertised and well-known injunction: "Safety First!" is being superseded in Britain by the questioning phrase: "Is it Safe?"

There have always been certain objections to the phrase "Safety First," although not to the course of action this slogan seeks to inculcate. Safety, first and foremost, is not the most desirable thing in life and industry. The provision of the things that sustain human life and civilization comes first, and this is not always compatible with absolute safety. Safety is certainly not the first consideration of those who go down to sea in ships, or of those who work in mines, on railways and in hazardous occupations. The man who desires absolute safety would be well advised to stay in bed. The phrase "safety first" has of course risen from a natural reaction against the placing of other considerations ahead of human safety, such considerations as profit and production. At one stage of the industrial evolution of the United States, the safety of the workers was about the last thing that was considered, either by the employers of labor or the workmen themselves. A different viewpoint is held today. Man is realized to be greater and of more value than his machines, and public opinion has swung around to the viewpoint of safety as a prime consideration.

The English phrasing suggests another point of view. The phrase "Is it Safe?" has the arresting virtue of a question. It suggests that there may be a safe way and an unsafe way of performing a given operation, and it appeals to the worker to use his brains in making his choice of method.

It is a commentary on the saneness of the British outlook, and the practical common-sense of the race, that, even in these times, when the phrase "safety first" sounds like an echo from a by-gone and halcyon age, the logic of a transatlantic phrase should be questioned, with a resulting modification of the wording to conform with the British idea, namely, that every operation should be approached with a questioning attitude as to the safest and most workmanlike method, but with the mental reservation that, whether safe or not, the accomplishment of the task is the first consideration.

## NEW PLANT AT ASBESTOS MINE.

The Asbestos Corporation of Canada have now completed their new cable-derrick equipment at the King mine. This plant consists of four cableway units, built by the Flory Manufacturing Co., of New York. Each unit consists of a carrier steel cable, 2½ in. in diameter, 892 ft. span, supported by two towers, 78 and 45 ft. high respectively, equipped with hoisting machinery, hoisting cable, conveying cable, etc., and capable of hoisting 10 tons, with a traction speed of 800 ft. a minute, while the hoisting speed is 266 ft. a minute. A feature of the plant is that the towers, the anchorage platforms, hoisting machinery, are all on wheels moving on rails, so that the whole cable derrick can be moved about very easily by a special motor. A double unit crushing plant is now being installed and will be completed in September. The object of this crushing and drying plant is to fill a large storage bin with milling rock which will supply the gyratory crushers of the asbestos mill. The milling operations, with this large storage bin supply to draw on, will therefore be independent of the mining operation, which could be suspended for some little time without affecting the work. The capacity of the completed plant will be 2,000 tons of rock per 10-hour shift, which would be approximately a capacity of 1¼ million tons a year on two shifts a day if the asbestos mines were worked continuously.

Very notable improvements have also taken place at the Jeffrey mines of the asbestos and asbestic mines at Danville, in their methods of mining. In the new workings, in the extension of the pits, the rock in the different benches is being handled by steam shovels which load direct on the cars supplying the mill; and the intention is to eventually do away with the cable-derricks, which will be replaced by an incline.

In the last four months the Bell Asbestos Mines have remodelled the mill, which has now reached a high efficiency. The steam boilers which used to supply about half the power necessary for operating the mine and the mill have been discarded for electric power. It may be mentioned that there is now a tendency to return to electric power for operating the mines and the mills in the asbestos district. In fact, only one operator is now using steam power. Some four years ago, on the contrary, electric power was being abandoned and replaced by steam plants. The new order of things is, in a great measure, due to the fact that the Continental Light and Power Co. and other electric power companies are now supplying the power on the meter system; whereas, before the contracts were made for so many horse-power a year, which had to be paid for whether used or not.

## THE PRICE OF MICA.

In a U. S. Commerce report under date of September 15th, 1915, Mr. F. S. S. Johnson, U. S. consul at Kingston, Ont., says:

"The price of fine-split amber mica, size 1 by 2, at present exported largely from the Ottawa district, and invoiced at from 20 to 35 cents per pound, is very low when the following facts are taken into consideration: Market value per pound of rough amber mica, 1 by 2, 12 cents; price paid for splitting 1 pound of amber mica, 12 cents; waste on 1 pound of fine amber mica, 4 cents; freight and handling from mine to factory, one-half cent; profit, 8 cents; total, 36½ cents.

"Most of the Ontario mica is mined in this consular district and taken to Ottawa to be trimmed and prepared for the American market. The fine-split amber mica is invoiced at this consulate at from 33 to 38 cents per pound."

The average price of sheet mica, including cut and uncut, in the United States in 1915, as deduced from the total production, was 68 cents a pound, as compared with 50 cents a pound in 1914 and 21 cents in 1913.

According to the preliminary report of the Mines Department, Ottawa, Canada exported to the United States in 1915, 879,631 pounds manufactured mica, valued at $236,124.

## PORCUPINE CROWN.

The development work at Porcupine Crown mine has been recently unusually interesting. In a winze below the 800 ft. level very good ore has been found. As the main orebody was high grade, the development of low grade ore with depth was disappointing. Now rich ore is being found at greater depth, and the outlook has brightened considerably.

# THE INDUSTRIAL PROBLEM

Mr. C. V. Corless, of Coniston, has an excellent article on the industrial problem, in the September number of the Canadian Mining Institute Bulletin. Regarding the solution, he says: "We are safe in saying that centuries may be required in working out the solution to the industrial problem, since this is merely a problem in social evolution. Social evolution is merely the continuous adjustment of social relations to meet changing conditions. As long as these change, we must have the problem with us. It is easy to adjust the parts of a machine. But when each part is itself infinitely complex—is, in fact, a human being, whose adjustment in industrial relations must be self-adjustment—it is self-evident that any real mitigation of industrial ills must be founded on the gradual growth of intelligence and ethical feeling. This I believe to be the surest way permanently to conserve and further to develop for industry the good results that Dr. Browne notes as arising from the war."

Mr. C. M. Gayley, of Berkley, says on the same subject, suggested by an article by Dr. David Browne, which was published in the Bulletin and in the Canadian Mining Journal:

"Dr. Browne is right. What we need in America as well as in Canada, is good-will and mutual interest between employer and employee—the cultivation and the maintenance for all time of the self-respect, the loyalty to worthy ideals, the habit of co-operation, that, as the result of the most wanton and saddest, and still grandest and most enduringly victorious of all conflicts for liberty, justice and democracy, have been instilled in the consciousness of all nationalities of Anglo-Saxon heritage."

Mr. R. W. Brigstocke, of Naughton, says:

"In my opinion, Dr. Browne's aspiration can be realized only if industry can be so organized that men will be employed at work which is or is made congenial to them; and, what is even more essential: if we can inculcate in our people the spirit of 'team play' in industry. Whether or not this implies the adoption of a form of socialism is immaterial. What is material, to secure the maximum national and industrial efficiency, is the promotion of the happiness and welfare of the greatest number."

## THE I. M. & M. AND TAXATION OF MINES.

On the invitation of the Institution of Mining and Metallurgy, a largely attended meeting of representatives of mining companies was held at River Plate House, Finsbury Circus, London, E. C., on August 8th. The meeting was convened to decide the action to be taken in regard to a "representative appeal" to the Excess Profits Tax Board of Referees in accordance with the terms of the correspondence, which was read, between the Institution and the Chancellor of the Exchequer, and also in regard to other questions affecting the economic interests of the mining and metal industries.

Mr. J. H. Cordner-James, vice-pres. Inst. M. M., presided, and in the course of his opening remarks he stated that the present system of taxation and other economic questions affecting the future of these industries had engaged the attention of the Institution for some time past. He also referred to the fact that the Institution of Mining and Metallurgy, the Iron and Steel Institute of Metals and the Institution of Mining Engineers, as representing all the branches of the mineral and metal industries, are acting together in urging upon the Imperial Government the necessity, in the national interest, for the establishment of a department of minerals and metals in the metropolis of the empire to co-ordinate information on its mineral resources, to assist and stimulate their development and to safeguard the economic interests of the mineral and metal industries.

Other speakers dealt particularly with the larger question of general taxation and gave concrete examples of gross anomalies in its incidence as affecting mines operating outside the United Kingdom, but registered and controlled in London. While recognizing that it was incumbent on all industries at the present time to make their maximum contribution to the National Exchequer, it was pointed out that the income and excess profits taxes on certain mines in their present forms were equivalent to confiscation of capital value, and that the result inevitably would be the restriction of output of certain metals, especially gold, and the removal on a large scale to other centres of mining companies at present domiciled in the United Kingdom. All were in complete agreement as to the necessity for immediate consideration of these wider questions with a view to joint action to secure reform.

The following resolutions were unanimously adopted, and the chairman briefly outlined the procedure in connection with the excess profits tax appeal:

1. That this meeting of representatives of the Mining Industry approves the action taken by the Council of the Institution of Mining and Metallurgy in regard to the excess profits tax, and pledges itself to support the Institution in the representative application to the Board of Referees referred to in the correspondence between the Institution and the Chancellor of the Exchequer.

2. That the following gentlemen be and are hereby appointed a committee, with power to appoint alternates, to act with the Council of the Institution in connection with the "representative application" to the Excess Profits Board of Referees and, later, in connection with wider questions affecting the mineral and metal industries, and in particular the effect of the present system of taxation of those industries: The Right Hon. Lord Harris, Sir Lionel Phillips, Bart., The Right Hon. Sir Alfred Mond, Bart., M.P., Sir Trevredyn R. Wynne, Mr. F. W. Baker, Mr. Edmund Davis, Mr. F. A. Govett, Mr. F. H. Hamilton, Mr. Henry C. Taylor, Mr. Leslie Urquhart, Mr. Oliver Wethered and Mr. Robert Williams, with power to add to their number.

3. That a fund be subscribed to meet the necessary expenses in giving effect to the preceding resolutions, such fund to be administered by the Institution of Mining and Metallurgy in conjunction with the appointed committee.

The secretary, Mr. C. McDermid, will communicate direct, at an early date, with mining companies, and all correspondence on the subject should be addressed to him at the House of the Institution, No. 1, Finsbury Circus.

## McINTYRE.

Good progress is being made at the McIntyre properties, and it is expected that McIntyre will show good earnings for the quarter ending September 30th. Considerable increase in production will be possible next year, when construction and development now under way become effective. The central shaft will be equipped for a larger tonnage, and an aerial tram will carry the ore to the mill.

# THE CONCENTRATION OF MOLYBDENITE BY FLOTATION

There has just been put into operation at Renfrew, Ontario, by the recently organized International Molybdenum company a plant for concentrating molybdenite. The process is a simple one and appears to be working very satisfactorily.

Some time ago the Orillia Molybdenum company, with which Mr. G. P. Grant was identified, established a refinery at Orillia and began the manufacture of molybdic acid and ammonium molybdate, for which there is now an excellent market. Experiments carried on in the Orillia laboratory resulted in the development of a very efficient process for concentrating molybdenite ores. Recently the Orillia company was merged with Mr. M. J. O'Brien's interests in a new company, the International Molybdenum Co., of which Mr. J. L. Murray, of Renfrew, is president. It was decided to build at Renfrew, using the process devised by Mr. Grant's company. This is now in successful operation.

When visited by the writer, the plant was running on low grade ore said to average less than one per cent. molybdenite. From this a rich concentrate, said to carry 70 to 80 per cent. molybdenite, was being obtained by one run over the "float," as the machine is called. This product is rich enough for treatment at the refinery. The grade is raised by screening, which removes a considerable part of the more finely ground material, largely iron sulphides.

It has been found advisable to keep the feed rather coarse, as very finely ground ore is much more difficult to treat. Good results are obtained from particles over 60 mesh, and it is probable that best results will be obtained from a feed between 20 and 60 mesh.

The machines will be described in detail in a later issue of this Journal. A brief description of the process follows:

The ore after passing through a gyratory crusher is ground by rolls. The crushed ore is fed dry to a drum revolving in water at the head of the float: a large percentage of the sulphides, including almost all the molybdenite, is thus floated. The stream passes down a gently-inclined box 12 ft. long. The iron sulphides are carried along with the molybdenite until they strike baffle boards, which help to sink them. The baffles are vertically placed boards, over the edge of which the water carries the molybdenite. They interfere very little with this mineral, but cause sinking of the other minerals.

No acids or oils are used in the process. The sulphides float readily on water and the baffles sink the undesirable ores, leaving the molybdenite.

The plant can treat about 50 tons in 12 hours. The company mines ore and is in the market to buy ore. The concentrates will be refined at Orillia, and the molybdenum will be used in the manufacture of molybdic acid, ammonium molybdate and ferromolybdenum.

## KOWKASH.

Timmins, Sept. 13.—Kowkash district has not done so badly. Within a year from discovery this new camp on the Transcontinental, 300 miles west of Cochrane, had its first private car. Last week-end a car of shareholders of the Tash-Orn Co., from Baltimore, Buffalo and other American cities, were in looking at their gold showings and claims.

The Tash-Orn Gold Mines, Ltd., have 14 claims around Tashota. The holdings are: Devanney-Morrison, four claims; Kline, four; Brennan, two; McDougall, one; Morrison, one; Wells, one. On the latter claim, the Wells, quite a deal of work has been done. A shaft is down 30 ft. and is to be sunk to 200 ft. At the surface the Wells had a series of seven or eight stringers, two or three inches wide. At the bottom of the shaft these have developed into an all-quartz vein. Free gold shows in it. On this claim the company will this fall install a six-drill compressor, two Tremains stamps and other machinery.

On the Devanney-Morrison claims there is a quartz-schist vein that at the surface and in the bottom of the 18-ft. shaft is about 7 ft. wide. Eight hundred feet of diamond drilling is being done here. The drill struck the vein at the 125 ft. and it was 16 ft. wide, according to good reports. This vein has been stripped for several hundred feet, several test pits have been sunk on it, and values show up big. This claim is one and a-half miles north of the railway. Most of the Tashota claims are hard by the railway, clustering close and handy to the track, as they do at the Boston creek on the T. & N. O.

The company intends to work most of the other claims it controls or owns, and will build central camps at the railway.

Veins showing large quantities of tellurides—possibly tellurides of bismuth, which are not thought much of—are included in the score of veins uncovered on the Kapps-Hendrickson claims. J. Guthrow is following up a strong lead on his claim by stripping. Sinking a short way has been done on the Gravelle-O'Gorman claim.—Toronto World.

## ANDERSON'S PARTY BACK.

Seattle, Wash., Sept. 11.—The steamship Northwestern arrived from Nome, Alaska, to-day with seven members of the Vilhjahnur Stefansson Canadian Arctic expedition that left Victoria, B.C., in the whaler Karluk, June 17th, 1913.

The men are Dr. Rudolph M. Anderson, of Des Moines, Iowa, second to Stefansson in command of the expedition; John J. O'Neill, geologist, of Port Colborne, Ont.; John R. Cox, topographer, Ottawa, Ont.; Diamond Jennes, anthropologist, Wellington, N.Z.; Fritz Johansen, naturalist, Copenhagen; George H. Wilkins, photographer, London, and Kenneth G. Chapman, topographer, New York. Anderson and his party will go direct to Ottawa to report to the Canadian government on their achievements.

Anderson and his accompanying scientists escaped the misfortunes that were encountered by the branch of the expedition that went from Nome on the Karluk, which was wrecked in the Arctic ice in the first winter out. Thirteen members of the Stefansson expedition, including five scientists, perished in the north.

## ST. ANTHONY GOLD MINE.

Toronto, Sept. 23.—An announcement was made yesterday of the sale of the St. Anthony mine at Sturgeon lake, near the Transcontinental railway, and about 100 miles northwest of Port Arthur. For a year an option has been held on the mine, and during that time the purchasers have spent about $90,000 in proving it up. The St. Anthony was opened up about ten years ago, but owing to financial difficulties it was closed down a few years ago. Geo. Glendinning, formerly of Cobalt, bought the property, and he has now sold it. The purchasers are the Lewishons and D. M. Steindler, of New York. Considerable gold has been produced from the mine, but the treatment of the ore presented some difficulties, which the new purchasers are evidently satisfied they can overcome. The purchase price has not been made public, but a first payment of $60,000 was made this week.

# CANADA'S WATER POWERS

Water power has played a most important role in the industrial development of the Dominion, and with the advances in electrical science, will play an even more important role in the future. Probably no country in the world is more fortunate in the extent and location of its white coal than is Canada. Practically every commercial centre from coast to coast, except only a few in the middle prairie provinces, have abundance of water power available, not only for present needs, but for all anticipated requirements. Indeed, the fortunate location of Canada's water powers is the outstanding feature of her water-power resources.

Furthermore, where there is not sufficient white coal available to furnish energy requirements, there is an abundance of black coal. So far as sources of energy for power producing agencies are concerned, Canada's position is pre-eminent.

Within the provinces of the Dominion of Canada, and excluding the Northwest Territories, practically all of the Yukon, and the northern and eastern portions of Quebec, it is estimated that 17,746,000 horse-power are available, this amount being inclusive, in the case of Niagara Falls, Fort Frances and the St. Mary's river at Sault Ste. Marie, of only the development permitted by international treaties, and, further, does not contemplate the full possibilities of storage for the improvement of present capacities. The developed powers, which are inclusive of all water powers, whether for electrical production, pulp-grinders, for mining and milling, or for the great many other uses, aggregate 1,712,193 horse-power, the distribution throughout the respective provinces being shown in the table hereunder:

**Developed Power in Canada.**

| Province. | Horse-power Developed. |
|---|---|
| Nova Scotia | 21,412 |
| New Brunswick | 13,390 |
| Prince Edward Island | 500 |
| Quebec | 520,000 |
| Ontario | 789,466 |
| Manitoba | 56,730 |
| Saskatchewan | 45 |
| Alberta | 33,305 |
| British Columbia | 265,345 |
| Yukon | 12,000 |
| Total | 1,712,193 |

The extent of the future development can be only limited by the available water powers. Practically all of the 1,712,193 horse-power enumerated above as developed from water power has been created within the last twenty years, and of this the last decade has seen practically two-thirds of the total produced. If such a rate of increase were projected into the future the 8,000,000 horse-power estimated to be available within range of present markets, will be entirely in use within fifteen years, and even by liberally discounting such a rate of increase, notwithstanding our confidence in being upon the threshold of an inconceivably prosperous future, such a condition of development may be readily approached within a generation.

With water power as a fundamental necessity in the industrial future the regulation and conservation of the river waters is to-day being demanded on a large scale, and this will naturally become more insistent as time goes on. It has been fortunate that, in Canada, the title to the water-power rights have largely remained under the control of the Dominion or Provincial Governments. The Dominion Government controls navigable streams and their water powers throughout the Dominion and the water powers in general of the provinces of Manitoba, Saskatchewan and Alberta. The administration of all water powers in British Columbia, Ontario, Quebec, New Brunswick and Nova Scotia is under respective provincial control.

The administrative policy of the Dominion Government and the various provinces may be readily studied in the five monographs included in a book recently published by the Dominion Water Power Branch, Ottawa. These treat in a "popular" way of the water powers of British Columbia; the prairie provinces of Manitoba, Saskatchewan and Alberta; Ontario; Quebec; and the maritime provinces of Prince Edward Island, New Brunswick and Nova Scotia. While it is impossible to treat in detail of the various sites and power developments existing throughout Canada, the more important are at least described in the most essential features.

These five monographs were originally prepared and published for distribution in connection with the water power exhibit of the Dominion Government in the Canadian pavilion at the Panama-Pacific International Exposition, and particularly for distribution to the members of the International Engineering Congress at San Francisco, September 20-25, 1915. Owing to the great demand for complete sets of the five monographs it was considered advisable to have them re-published under one cover.

## BRITISH-AMERICAN NICKEL.

At a meeting of the Sudbury Board of Trade this month, Mr. J. A. Holmes said, according to the Sudbury Mining News, that he had seen Mr. Dunn, president of the British-America Nickel corporation, and has gone pretty fully into the power situation. The company figured on developing about 7,500 horse-power at Twin Chutes, which would be sufficient for mining and smelting operations only, but they had no power in sight for the refining end. The company preferred to refine at the Murray, providing they could get power at a reasonable figure. Mr. Holmes pointed out that when their operations closed down about two years ago the company had planned to bring power from French river, through the Hydro-Electric. The Dominion and Provincial governments were working together then. The company's engineers estimated at that time that power could be delivered in Sudbury at about $9 per h.p.; in fact, Mr. J. R. Booth had offered to deliver all the power required at $10 per h.p. The process to be used in refining was electrolytic, and it was essential to have cheap power, as to do the work planned it would require about 7,000 h.p. over and above that available at Twin Chutes. The company expected to handle 5,000 tons daily, which would be about double what the Canadian Copper Co. are treating at present. The British-America people did not wish to develop powers on their own account, and if Hydro-Electric would come in the company would hand over Twin Chutes. Neither did the company desire to house their employees, except the few whom it would be necessary to have at the mine all the time, but they preferred to have the others live in Sudbury. Mr. Holmes thought it looked like good business to get busy and try to get the refinery here, and the first step in this direction would be to get the town council to ask the Hydro-Electric to investigate. The refinery would be a big thing for the district if it could be landed, and it can be landed if Sudbury can induce Hydro. The refining

plant alone would cost perhaps $1,500,000. There had been considerable discussion at the board on various occasions about securing industries, but it would take a good many to equal a refining plant.

Mr. O'Connor said he had had the pleasure of an interview with Mr. Dunn and Mr. E. R. Wood, of Toronto. The latter had stated that he had taken up the French river power project with Sir Adam Beck and Mr. Gaby, who had told him that it could not be delivered in Sudbury for less than $25 per h.p. This amount was prohibitive, and unless some other than the French river was available, it was not worth while doing anything.

Mr. Holmes pointed out that the French river is only one of many available powers. The Ottawa river is full of powers, and the French river has two others in addition to the Chaudiere falls. The British-America Co.'s engineer had assured him that power could be delivered at not more than $10, and that the pole line would be only 45 miles long. There was another power above High falls with a head of 22 ft., but he could not say offhand if it was available.

Mr. Black said that when he was in Toronto recently he saw Mr. Gaby and spent some time with him. They had gone over the power situation, and he found that Mr. Gaby was better posted than anyone here. He had all the necessary data and had informed him that the Hydro-Electric Commission would come to Sudbury if invited, but the invitation must come through Sudbury as a municipality. With reference to guarantee of bonds by Sudbury, Mr. Gaby said that Sudbury would only be responsible for power used in Sudbury. The Commission was prepared to make a survey and give a report on estimated cost without one dollar of expense to Sudbury. The town would only have to assume liability for 100 h.p., or they would even come for 50 h.p.; the power would cost $20 or less, according to quantity taken.

## INTERNATIONAL NICKEL CO.

New York, Sept. 23.—As a result of pressure on International Nickel Co. for nickel, the management has set aside $5,500,000 from cash on hand for construction of a refinery in Canada and extension of its smelters and other facilities. All this money will be spent in Canada.

It has been realized by the directors that the present capacity of its plant is inadequate to meet the demands for nickel. Consequently, enlargement and new construction programme will be begun immediately and will be rushed.

This expenditure will eventually be capitalized and distributed to the common shareholders in a stock dividend, following the custom of the Nickel management. Capitalization of this investment would indicate that the stock dividend when authorized will amount to 10 per cent. or higher. The last previous distribution in stock was 10 per cent. last year.

A straw showing the demand for nickel is the fact that Midvale Steel has just placed a contract with the International Nickel Co. for 8,000,000 lb. to be delivered over a period. Early this year International Nickel received an order from the British Government for a very large tonnage of nickel to be delivered over 12 months.

In August the International Nickel Co. sold 7,600,000 lb. of nickel, or 1,500,000 lb. more than ever sold in any previous month. With such great demand the company has been unable to maintain the reserve supply which according to its policy it has kept on hand.

Buying of the stock in the last few weeks has been based on realization by investors of the great strength of the company's position. Unlike other metals, the price is not subject to wide fluctuations. The policy of the International Nickel Co. has been to encourage consumption by selling at a reasonably low price.

On the basis of dividends of 24 per cent., or $6 a share, International Nickel, at present figures, yields better than 12 per cent. on the investment. It has been the history of the company that dividends are on a steadily rising scale despite the fact of stock distribution in the interim.—Boston News Bureau.

## THE ARCTIC EXPEDITION.

Dr. R. M. Anderson, accompanied by Mrs. Anderson, arrived in Vancouver recently from Seattle on the steamer Sol Duc. The Colonist interviewed him and published the following:

Dr. Anderson was in charge of the southern party of the Canadian Arctic expedition under V. Stefansson, which left Victoria in June, 1913. He will leave shortly for Ottawa, where he will be engaged for the next six months or so in connection with matters pertaining to his northern research. Other members of the southern party who reached the city a few days ago are already on their way to the capital. F. Johansen, marine biologist and botanist, left the party at Ketchikan, Alaska, and went east over the Grand Trunk Pacific from Prince Rupert. The numerous specimens collected by the party are already on their way to Ottawa.

Dr. Anderson states that Mr. Kenneth G. Chipman, who was with the party and is attached to the permanent Dominion staff, spent seven years in British Columbia engaged on surveys. Mr. Chipman was engaged in extensive surveys on the south side of Coronation gulf, and came out with one of the members of the R. N. W. police patrol which went north this spring. They traveled to Great Bear lake and thence to Fort Norman, and he boarded one of the Hudson's Bay boats running up the McKenzie river.

The most interesting of the discoveries made by the party from an historical point of view was the cairn made out of rocks by Sir John Richardson at Cape Krusenstein during the latter's expedition of 1848 in company with Dr. Rae. No records of any kind were found in the cairn. As much detail as it is possible for Dr. Anderson to give to the public regarding their Arctic explorations has already been published.

Asked as to the nature of the country in which the explorer has spent the past three years, Dr. Anderson states that the whole northern coast gradually slopes down to the Arctic seas, the hills being only 200 to 300 ft. high, and there are no high, rugged mountains. The snow is usually all gone, except on the top of the hills, by the middle of June, and the freeze-up takes place about October 10th. In some cases it may freeze up a month earlier, but this would be very unusual. The time at which the sea freezes up depends largely on the amount of ice floating around outside, and as winter approaches the northwest winds bring this down to the coast.

The party intended to work the first winter at a point east of the McKenzie river, but they did not manage to make it. The year 1913 was a bad one for traveling and several ships were caught and frozen in between Point Barrow and Demarcation point, and failed to make their destination to Herschel island. One of the southern party's vessels was frozen in at Collinson point, Alaska, near the place where Captain Collinson wintered in about the year 1854. The party

was disappointed in not getting further in, but the topographical survey was finished in the spring of 1914 from Demarcation point, between Alaska and Yukon territory. Sledge parties went south and did this work at Firth river. In the late spring and summer they made a survey of the McKenzie delta, east and west branches. The delta is about 150 miles long and 50 to 75 miles wide at the outer edge.

In the summer of 1914 they succeeded in getting into Dolphin and Union straits at the west end of Coronation gulf, and in the fall of 1914 and spring of 1915 a survey was completed west from there to Cape Parry. This survey included quite a portion of the coastline that had never been mapped. They also mapped up one of the large rivers, unnamed, at Darnley bay.

In the spring of 1915 the party also surveyed the west end of Coronation gulf and the Rae river, which had never been explored to any extent before. This river was named after the famous explorer, Dr. Rae, who was very well known in connection with the Franklin expedition. In the summer of 1915 Mr. O'Neil, the geologist, and Mr. Cox surveyed the Tree river in Coronation gulf, south side. This is one of the large rivers east of the Copper Mine river. Late in the summer they took a 20-ft. gas launch and a large 30-ft. skin canoe, with motor attached, and surveyed the coast of Arctic sound, some distance up the Hood river, and a large part of Bathurst inlet, as far as the Kent peninsula, which was the eastern extremity of the work assigned to the southern party of the expedition.

**Native Copper Deposits.**

The principal object of this branch of the expedition was to make a geological investigation of this region with a view to ascertaining the extent of the copper-bearing rock. It has been known for some years that the district was rich in copper, as the Eskimos were discovered using knives, arrowheads, lances, spears, ice-picks, etc., made out of pure copper. The object of the party was to find out the real extent of the copper deposits.

Dr. Anderson states that he is not in a position to give out the exact known areas of this deposit, but they had made a careful estimate, which will be submitted at Ottawa. The copper is scattered fairly uniformly in fine grains through the rock, like pepper. The rock is a black diabase. Specimens, however, brought in by the Eskimos have consisted of pure copper weighing over 40 lb.

It is not anticipated by Dr. Anderson that there will be any necessity for their returning to the district in which they have been engaged, as the work for which they went north has been entirely finished.

## THE HUDSON BAY RAILWAY.

"Work on the Hudson Bay railway is progressing very favorably," says Mr. W. J. Young, of the staff at Piquitena.

On Saturday, September 9th, steel had been laid as far as Mile 292, and by September 16th it will have reached 300. Kettle Rapids is some 30 miles further on, and by the first day of October that point will have been reached. Some difficulty has been experienced in obtaining sufficient labor for the pushing ahead of construction. A steady supply of rails is required also; those being laid down now having been gathered from sidings not required at present and from the road-bed leading to the terminals at The Pas Annex. Mr. Young says: "Given a fair show in labor and rail supplies, the Hudson Bay railway will positively be in the bay port one year hence."—The Pas Herald.

## PHOSPHATE IN ALBERTA.

In a report on the discovery of phosphate in Alberta, Mr. H. S. de Schmid, of the Department of Mines, Ottawa, says:

There are in the Banff district four parallel, approximately north and south fault strips, in each of which is represented a certain thickness of Rocky Mountain quartzite, the uppermost member of the Upper Carboniferous or Pennsylvania formation.

Only in the two middle belts was the presence of a definite phosphate horizon established; in the western and eastern belts a considerable thickness of the upper quartzite beds (containing the phosphoria or phosphate bearing formation) is absent, having been either eroded, overridden or down-faulted.

The phosphate horizon occurs in the upper 50-60 feet of the Rocky Mountain quartzite, and is overlain by massive, grey harsh chert-quartzite. Below it follow beds of whitish or grey quartzite, often separated by thin, brown shaly partings, and these quartzites are underlain by black, dense chert. Many of the quartzites and shaly partings are phosphatic, but the only phosphatic horizon of any possible consequence is the main phosphate bed. The average thickness of this bed may be taken as 12 inches.

The phosphate is black in color, and is very dense and compact. It is fine grained and quite hard. Dark, purple fluorite is almost always present in some amount. The material of the bed consists variously of more or less pure, massive phosphate or of nodular masses of phosphate in a dark-grey quartzite matrix. The proportion of phosphate to silica in the latter case is distinctly variable at different localities.

The average dip of the phosphate bed and the enclosing quartzite series is 55 deg. west.

The highest phosphoric acid content obtained from samples taken across the entire bed was 27.63 per cent., equivalent to 60.37 per cent. bone phosphate.

The average of nine analyses of samples taken at four widely separated points and in two adjacent fault strips showed 20.0 per cent $P_2O_5$ or 43.7 per cent. $Ca_3(PO_4)_2$.

The highest content of ferric oxide was 2.71 per cent. and the average of 1.50 per cent., while the average iron and alumina combined amounted to 1.95 per cent. The iron and alumina content is thus well below the maximum of 3 per cent. required by superphosphate manufacturers.

There are at least two outcrops of the phosphate bed that are conveniently situated as regards accessibility and transportation facilities, the one being about 4 miles from Banff station and the other hardly more than a mile from the railroad.

While unsuited to the manufacture of superphosphate by the sulphuric acid method, owing to the low content of tricalcic phosphate (average of nine analyses from various outcrops, 43.7 per cent.) and to the large amount of silica present (average of nine analyses, 43.3 per cent.), the Alberta rock would possibly prove suitable for treatment by one of the thermic processes that have lately been proposed to supplant the sulphuric acid method.

Several of these processes are specially designed to employ low grade phosphate rock as raw material, the particular rock in view being impure, calcareous or clayey phosphates high in iron and alumina. None of the proposed methods, however, have as yet been proved commercial successes. With the advent of a commercial, thermic process, the natural gas resources of

Alberta may perhaps prove an important factor in the possibility of utilizing this low grade Alberta phosphate.

For purposes of comparison, it may be stated that the most northerly Montana phosphate so far reported on by officers of the United States Geological Survey (that of the Elliston district, near Helena), contains an average of 65 per cent. tricalcic phosphate, the bed ranging in thickness from 3 to 5 ft. These deposits are situated from 2 to 7 miles from the Northern Pacific railway, and are regarded as readily capable of development.

The distance in a direct line from the Elliston outcrops to those of the Banff district is approximately 350 miles, and to the International boundary 190 miles. Assuming, as seems probable, that the Banff bed is a northerly extension of the Montana deposits, we have a belt of about 160 miles in Canada, along which phosphate outcrops may possibly be met with. The extension of the phosphoria series to the north of Banff is not taken into account here.

## PRICES IN CANADA, 1915.

The great rise in prices during the war, which became very steep after the middle of 1915, is shown in the report just issued by the Department of Labor, entitled "Wholesale Prices in Canada, 1915," which also contains information regarding retail prices and prices in other countries.

In Canada the wholesale prices of 272 commodities averaged over 8 per cent. higher than in 1914 and 9 per cent. higher than in 1913, while the retail prices of some 30 foods were 2 per cent. higher than in 1914 and 7 per cent. higher than in 1913, allowing for the importance of each article in family consumption. By December, 1915, however, the steep rise had brought the index number of wholesale prices to a point 20 per cent. higher than in July, 1914, while retail food prices had risen 10 per cent. during the same period.

The index number of wholesale prices stood at 148.0 for the year as compared with 136.1 for 1914, and 135.5 for 1913, but by December, 1915, had reached 161.1 as compared with 134.6 for July, 1914. A weekly family budget of food averaged $7.86 for 1915, $7.73 for 1914, and $7.33 for 1913, but for December, 1915, stood at $8.13 as compared with $7.42 in July, 1914.

It may be noted that the rise in prices has continued during the current year, as shown from month to month in the Labor Gazette. The index number of wholesale prices reached 180.9 for May, but declined slightly thereafter, metals, chemicals and certain materials being lower. In retail food prices the weekly budget reached $8.63 for August, there being a decline only in July, when midsummer conditions lowered prices very slightly.

In other countries retail food prices also rose steeply, the rise from the beginning of the war to the end of 1915 being calculated as high as 113 per cent. for Austria, 83 per cent. for Germany, over 30 per cent. in the Netherlands, Norway and Italy, and 44 per cent. in Great Britain. In Australia the rise was nearly 30 per cent., as a result of drought, while in New Zealand it was only 16 per cent. In Japan, prices were lower than in 1914 and 1913.

"The results of the great rises were considerable increases in the cost of living, particularly in the expenditure on foods. In clothing, house furnishings, etc., stocks in the hands of manufacturers and dealers were often sufficient to prevent great rises for some time, even a year or more, but in food increases were immediately felt. At the beginning of 1915 staple foods were substantially higher than before the war, though in many cases somewhat lower than the high levels reached during the few weeks of uncertainty and speculation which followed its outbreak."

The report shows that the rising prices were accompanied by increased activity in industry and trade. "Not only did the needs for the prosecution of the war make necessary increased production in many lines and new production in goods never before attempted or thought of, but production was renewed in many lines and in many districts abandoned previously owing to the poor returns normally obtainable. These changes again had great influence in stimulating other branches of industry and trade, causing higher prices. This reaction was soon experienced in many lines at first depressed by war conditions. In Canada, wheat, oats, flour, cheese, butter, packed meats, pulp and paper first felt the stimulation of increased demand due to war conditions, but these were soon followed by wool, fish, leather, zinc, copper, chemicals, New Brunswick lumber, linseed oil, and later iron and steel, as well as most metals and metal products. In the latter part of 1915 the upward movement was particularly strong in metals, chemicals and wool, while in jute, silk, rubber, etc., among imported materials, the rise was marked."

## VENUS MINE, SOUTHERN YUKON.

Prospects are reported to be bright for what are known as the Conrad mining properties situated in the neighborhood of Windy Arm, Southern Yukon. Included in some notes published by the Daily Alaskan, Skagway, Alaska, after a recent visit to that place of Mr. J. E. McFarland, superintendent at the Venus mine, were the following particulars:

Returns from shipments of ore made from the mine have been most promising to the operators. Under present working conditions, ore will be shipped at least every fortnight. The steamer Ena, which left Skagway lately, took south a fair-sized shipment of ore. Stopes are being worked both above and below the main level of the Venus mine, which level has been driven about 2,000 ft.

The plans of the operators call for the installation of modern machinery and the adoption of the latest methods in mining and handling the ore. Heretofore ore has been sacked for shipment, but to save time and ensure dispatch in getting it away, it will be shipped in bulk in future.

## METALLURGICAL RESEARCH.

The Government Research Council, London, having made a grant of £1,000 per annum towards the cost of carrying on the research inaugurated by the Institute of Metals Corrosion Committee into the causes of the corrosion of marine condenser tubes, it has been found possible by the Corrosion Research committee, which has recently been re-constituted so as to include representatives of all bodies interested in the subject, greatly to extend their sphere of activities. Two salaried investigators have been appointed in the persons of Captain G. D. Bengough, D.Sc., and Dr. O. F. Hudson. They will conduct scientific researches on the committee's condenser plant now about to be installed by the courtesy of the Brighton corporation, in the Brighton Electricity Works. The plant will be worked under ordinary industrial conditions, the microscopical and other examination of the metal treated at Brighton being carried out in the metallurgical laboratories of the Imperial College of Science and Technology, South Kensington.

# THE HERB LAKE GOLD DISTRICT, MANITOBA*

By R. C. Wallace.

Herb lake, near the eastern end of the belt, may be reached either from the Hudson Bay Railway line from The Pas, or by canoe from Athapapuskow lake. The latter route, though longer, is more interesting, by reason of the fact that it traverses practically the whole mineral-bearing area. From the east end of Athapapuskow lake a portage is made to the Cranberry lakes at the head waters of the Grassy river. This river is followed down through Elbow lake, Island lake, Reed lake and Sandy lake, into Herb lake. The route is a well-travelled one, and the time required is five days from the steamboat landing at the mouth of the Sturgeon river. Herb lake may be reached from the railway line most conveniently, either from Mile 86 or Mile 137. From Mile 86 a portage of 14 miles leads direct into the south end of Herb lake. This route is, however, a difficult one for the transportation of canoes or heavy packs. A longer, but more feasible, route is from Mile 137, portaging through to Setting lake, thence up the Grassy river, through Pakwahlgan lake into Herb lake, the journey taking altogether about three days.

The first mineral discoveries in that part of the belt which lies within the province of Manitoba were made on Herb lake, where gold was found in a quartz vein on the Kiski Wekusko property. Since that time several veins have been discovered on the east side of Herb lake. Staking has also been done on the south side of Island lake, on Little Herb lake and on Thicket Portage. In the principal district—the east side and northeast end of Herb lake—the veins occur in a sheared sediment or in a basic volcanic which borders the sediment on the side. The strike is north, or somewhat east of north, and the dip uniformly towards the east. The quartz veins are lenticular, in places 10 to 12 ft. wide, narrowing down to stringers or even disappearing, and again widening when followed along the shear zone. The heaviest veins occur in the Rex group and the Kiski-Wekusko property, the average width being somewhat over three feet. The characteristic mineralization is arsenopyrite, which occurs practically solid in the walls and disseminated in stringers in the veins. Copper pyrites, zincblende and galena are found sparingly, and the gold occurs in good showings in a white saccharoidal quartz. Though the walls are highly impregnated with sulphide, the veins are only sparingly mineralized. Tourmaline is almost invariably present.

On the Kiski-Wekusko property two main veins have been stripped continuously for 500 ft. and 700 ft. respectively, while the single vein on the Rex property has been followed approximately 1,900 ft. These distances do not represent all quartz veins, but well-defined shear lines, more or less continuously filled with quartz. Frequently also small stringers, no doubt connected with the main veins, have invaded the country rocks, and may be traced considerable distances from the main body.

Nearer the contact with the granite, which lies west of the sedimentary band, the veins are more irregular in length and in width, but show good surface values in gold. The Ginger claim and the Molybdenite property, at the north end of Crowduck bay, are in the granite. The situation is reported to be similar at Little Herb lake, while McCafferty's lens-shaped vein is practically on a contact zone.

A line of claims has been staked in greenstone on the south of the Island lake as a result of the discovery of very rich float rock on the shore of the lake. The vein from which the float has been broken off has not yet been found.

Mica occurs in fairly large flakes in pegmatitic veins on the west side of Crowduck bay, and a quartz vein on the Grassy river, immediately below Crowduck bay, contains good showings of molybdenite. Magnetite is reported from an eastern part of the area, but the occurrence was not visited.

Though no sinking has been done on the quartz veins on Herb lake, they have been very thoroughly stripped, even where the overburden is quite heavy, and careful surface sampling is now possible throughout the length of the more important veins.

The discovery of the sulphides has attracted the active interest of several American mining corporations of standing, which augurs well for the future development of mining in the district. It has not yet, however, attracted a sufficiently large number of prospectors. The greater part of the belt is absolutely unprospected. When the extent of the mineral belt is realized, and when it is known that it is entirely probable that only a small number of the sulphide bodies—and perhaps also of the gold-bearing quartz veins—have yet been discovered, the prospector will, under happier post-bellum conditions, undoubtedly find his way into the district.

*From a report made for the Public Utilities Commission, Manitoba.

## PLUNGING INTO PEACE.

Rebounding from two years and more of the most destructive and wasteful war in history, the world will plunge into a trade and economic contest in which forces will assume totally new alignments, when competition will be keener and stronger than ever, and when science and organization will play a leading part in any successful role. For this struggle Canada must gird up her loins and make ready her full equipment of preparedness. She has the advantage over many other countries in richness and abundance of resources, in geographical world position, in vigor of race and in robustness of intellectual and moral fibre, while hope, verging on pronounced optimism, is an abiding and stimulating force with our people.

"I doubt, however, if we yet sense adequately the unnatural situation in which we have become involved, or the wrench and strain that will accompany the resumption of our natural and normal position.

"The question which it seems to me each should face is this: 'What will be the situation as regards our industry in Canada when the war ends and how can we best meet it?' "—The Right. Hon. Sir George Foster, in his Call to Action.

## FIELD TELEPHONE CABLE.

The Standard Underground Cable Co. of Canada, Limited, Hamilton, Ont., is at work on a large order of field telephone cable. The extensive use made of electricity on a modern battle field for signalling to, and otherwise communicating with, widely scattered bodies of troops, renders electrical conductors a vital factor in the handling of armies, and the frequent destruction and rapid deterioration of such systems of conductors in this service necessitates an enormous and continuous supply. A large order for seamless copper tubes to be used as shrapnel bands has also recently been received.

# ONTARIO'S METAL PRODUCTION

Returns of production for the first six months of 1916, made to the Ontario Bureau of Mines by the metalliferous mines and works of the province, are summarized in the following table, which also gives comparative quantities and values for the corresponding period of 1915.

| | 1915. | 1916. | 1915. | 1916. |
|---|---|---|---|---|
| | Quantity. | | Value. | |
| Gold, oz. | 173,021 | 235,060 | 3,570,072 | 4,822,740 |
| Silver, oz. | 11,101,909 | 10,267,743 | 5,188,763 | 6,188,269 |
| Copper, lb. | ..... | 77,795 | ..... | 14,368 |
| Cobalt (metallic), lb. | ..... | 121,817 | ..... | 103,677 |
| Nickel (metallic), lb. | ..... | 13,933 | ..... | 5,899 |
| Molybdenite (concentrates), lb. | ..... | 12,631 | ..... | 13,075 |
| Cobalt and nickel oxides, lb. | 141,500 | 401,408 | 56,312 | 204,638 |
| Copper in matte, tons. | 8,523 | 11,426½ | 1,704,600 | 2,285,096 |
| Nickel in matte, tons | 15,182 | 20,651½ | 7,591,000 | 10,325,766 |
| Iron ore, tons | 134,077 | 80,69 | 288,296 | 243,268 |
| Pig iron, tons | 225,940 | 295,349 | 2,856,040 | 4,424,496 |

The production for the six months ending June 30th, 1916, shows a material increase in value of all metals over that for the first six months of 1915, with the single exception of iron ore.

### Gold.

If the present rate of production is maintained Ontario should reach the $10,000,000 mark for 1916, as compared with $8,500,000 for 1915. Of the total yield the Porcupine camp contributed all with the exception of $545,434 produced by the Croesus in Munro township, the Rognon near Dryden, the Tough-Oakes at Kirkland Lake and the Canadian Exploration Co. at Long Lake, near Sudbury. The Hollinger Consolidated and Dome Mines are the big producers of the Porcupine camp. Before the year is out Boston Creek will probably be contributing to Ontario's gold production. Development is proceeding on some of the more promising claims at Kowkash, situated east of Lake Nipigon on the Transcontinental Railway.

### Silver.

Since the beginning of 1916 the price of silver has advanced considerably, the average being 62½c per oz., low 56½ and high 77¼c. As a result production has been stimulated, and the value as compared with 1915 figures shows a considerable increase. Although the ounces sold were less than for the corresponding six months' period of 1915, the total production was greater, over 1,000,000 oz. remaining to be marketed. Undoubtedly the life of the Cobalt camp will be prolonged as the result of introducing flotation treatment for handling low grade dumps and slimes. Nipissing still leads in output with a valuation of $1,766,561. The Mining Corporation of Canada (Cobalt Lake and Townsite City) is the next large producer, followed by Kerr Lake, Coniagas, McKinley-Darragh-Savage, Seneca-Superior, etc., in the order named.

### Cobalt.

With the outbreak of war the European market for cobalt oxide was suddenly cut off. However, new markets and new uses for metallic cobalt have improved the situation. High grade steels are now produced from cobalt alloys. Metallic cobalt production is greatly in excess of last year.

### Nickel.

Metallic nickel from Cobalt district ores is produced at the refining works of the Deloro Smelting and Reduction Co., Limited, formerly known as the Deloro Mining and Reduction Co. The output shows an increase over the 1915 production, which was not marketed during the six months' period.

### Copper.

Apart from the nickel-copper deposits of Sudbury, there has been a revival of copper ore mining in Ontario, partly due to the high price of the metal. The old Tip-Top mine and other properties near Mine Centre, in the district of Rainy River, are now producing. The Rand Syndicate is operating near Timagami. The Sable River Copper Co. at Massey, has erected a mill and is using the flotation process for the treatment of copper ore.

### Nickel-Copper Matte.

The smelters of the Canadian Copper Co., at Copper Cliff, and the Mond Nickel Co. at Coniston, are turning out nickel-copper matte at an unprecedented rate. The production, as compared with the first six months of 1915, shows an increase of nearly 40 per cent. The valuation of the metallic contents of the matte has been made on a basis of 10 cents per lb. for copper and 25 cents for nickel. The figures given for metallic copper and nickel separately show that the prices were over 18 and 42 cents per lb., respectively.

In addition to the above mentioned companies, the Alexo mine, near Porquis Junction, produces a small amount of nickel-copper ore, which is treated at the Coniston smelter.

### Molybdenite.

This mineral occurs widely in Ontario, but is mined chiefly in Renfrew county. It is wanted at the present time for use in the manufacture of high-speed tool steel, and for this purpose molybdenum will probably replace tungsten to some extent. The demand for molybdenum steel, to be used in munition factories, comes largely from the allied nations, Britain, France and Russia. Molybdenite concentrates, containing 85 per cent. or more of $MoS_2$ are worth about one dollar per lb. Ferro-molybdenum is now (September) being manufactured for the first time in Canada by the Orillia Molybdenum Co. at Orillia, and the Tivani Electric Steel Co. at Belleville.

### Iron Ore and Pig Iron.

The only shipments of iron ore were from the Magpie mine, operated by the Algoma Steel Corporation at Sault Ste. Marie. Although iron ore production shows a decrease as compared with the same period in 1915, that of pig iron shows a material increase, both in tonnage and value.

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## HOLLINGER.

Every effort is being made to shorten the time which must elapse before Hollinger can make the increase in production necessary to fulfil the plans of the directors. Since the merger with Acme the distribution to shareholders has been increased to such an extent that the big surplus is being used up. With the new mill completed, production will be large enough to warrant the present rate of dividends and at the same time build up a surplus.

The foundation for the addition to the mill has been completed, and the stamps should be dropping next spring. By that time the new central shaft should be ready for operation.

# SULPHIDE DEPOSITS AT FLIN-FLON AND SCHIST LAKES, MANITOBA

Prof. R. C. Wallace, of the University of Manitoba, accompanied by J. S. DeLury, lecturer in geology at the same institution, returned recently from a short examination of the copper and gold deposits of northern Manitoba. His description of the geological conditions will be read with interest by hundreds both in Canada and the United States who have never visited the region, but whose attention has been directed to it through the many promising discoveries that have already been made. It will be noticed that Prof. Wallace does not indicate either the results of sampling of the ore bodies nor the depth to which the ore has been proved. These very important details he was not at liberty to reveal until certain negotiations at present being conducted shall have ended. Prof. Wallace says of a brief investigation of the Flin-Flon lake eastwards to Setting lake:

At the northern edge of the limestone a band of Keewatin and Huronian rocks extends eastwards from Beaver lake almost uninterruptedly to a point on the Grassy river, 15 miles east of Herb lake. The belt is approximately 120 miles long, and of very irregular width. The average width is probably 15 miles long. With the exception of the western margin of this belt, from Beaver lake to Flin-Flon lake (a distance of 15 miles), the area lies in the province of Manitoba. The centre of the belt is 60 miles north of the town of The Pas, which is the natural point of communication with the district. In the eastern part of the belt, the Hudson Bay railway has been of service in opening up the country, and in stimulating prospecting, as contact may be made with the belt at several points on the line.

The greatest interest has been shown in the discoveries of sulphide at Flin-Flon and Schist lakes. To reach these points, part of the journey from The Pas is made by means of the Ross Navigation Co.'s steamboat up the Saskatchewan river, via Cumberland House, through Cumberland and Sturgeon lakes to the mouth of the Sturgeon river. From this point the canoe route leads up the Goose river through Goose lake. From Athapupuskow lake there is an all-water route into Schist lake, and two portages from Schist lake into Flin-Flon lake.

The wagon road to be constructed by the provincial government from Sturgeon lake to Athapupuskow lake will very materially lessen the distance and the cost of transportation by obviating the necessity of travelling on Goose river and Goose creek. An alternative, though somewhat more difficult route, into Flin-Flon lake, is by wagon road from Beaver landing on Sturgeon lake (a point of call for the Ross Navigation Co.'s steamboat) to Beaver lake, and from Beaver lake either by the Copper lake or the Sucker creek route.

Through the work of Mr. Tyrrell and Mr. McInnes, of the Geological Survey of Canada, the Keewatin-Huronian belt north of The Pas was delineated, and the possibility of mineral deposits was indicated, before actual discoveries were made. Since the discovery of gold at Beaver lake, Dr. Bruce, of the Geological Survey of Canada, has spent three seasons in the district, preparing a map which will define the geological relationships, and will cover a large amount of ground hitherto unmapped.

Three geological phases are represented in the district: (1) The outpouring of lavas, mainly basic, but in part acidic, occurring as massive and ellipsoidal basalts, sheared greenstones, and sericitic quartz porphyries; (2) the deposition of sediment on these lavas, shown as fresh and sheared conglomerates, with pebbles of granite, quartz and jasper, and very commonly as sheared quartz, etc., which have developed into sericitic schists, hardly to be distinguished from the acid igneous eruptives; (3) the intrusion of masses of granite which flank the whole belt on the north side. The granite is frequently dark grey near the contact, but usually pinkish farther from the rocks, which it intrudes. To this granite, or to certain outcrops of this granite, are to be ascribed the sulphite bodies and the mineralization of the quartz veins. While the sulphide bodies and, with few exceptions, the mineralized quartz veins, occur not in the granite, but in the basic eruptives or the sediments, the presence of isolated crystals of arsenopyrite —a mineral characteristic of the mineralization of the district as a whole—in the massive granite, is significant of the origin of the ore deposits. Some staking has been on quartz veins in the granite, but practically all the discoveries made up to date are on the northern edge of the eruptives and sediments in close proximity to the granite. This granite has not only mineralized the rock which it intruded, but has in places changed it to a very marked degree. This is best illustrated at the northeast end of Herb lake, where a fine-grained sediment has been metamorphosed into a coarse staurolite schist, which grades off on the farther side from the granite into a garnetiferous schist.

Southwards, the belt disappears underneath a reddish limestone formation which was deposited much later than the youngest of the rocks hitherto described. There is consequently no "contact" with the limestone in the sense in which the term is undertsood by the prospector, and consequently no foundation for the somewhat widespread belief that the edge of the limestone should be good prospecting ground. In one sense, however, the limestone has been of undoubted economic importance. It has, to a large extent, protected the comparatively soft Keewatin-Huronian belt with its ore deposits from preglacial and glacial erosion. But for the protective capping of the limestone, which extended much farther north than its present limits, the whole belt would have been completely eroded away.

Two types of ore deposits occur most prominently in the district: (a) Sulphide ore bodies; (b) gold quartz veins. The characteristics are distinctive, and the types may be conveniently discussed independently.

### The Sulphide Deposits.

Widespread interest has been taken in the district since the discovery was made last autumn of large bodies of mixed sulphides on the east side of Flin-Flon lake. Subsequently a similar ore body was found on the west side of the middle arm of Schist lake, and more recently sulphides have been discovered on Athapuskow lake, Copper lake and Sandy lake. As a rule, the sulphides occur in intermediate volcanic rocks in close proximity to the younger granite. They have been formed as replacement deposits in zones of weakness, along fault planes or planes of brecciation. The petrological character of the replaced rocks seems to have been of less significance than the brecciation, as in practically all the ore bodies examined, unmineralized horses of similar rock to that replaced occur in the ore bodies—the rock of the horse not having been affected by the shearing. No quartz accompanies the ore bodies.

Up to date sulphide bodies have proved to be of considerable economic importance. They are located respectively on the south-east end of Flin-Flon lake and on the west side of the middle arm of Schist lake. Both

properties have been cross-trenched to expose the unweathered ore and the deposits have been prospected by diamond drilling.

Owing to businss negotiations pending on the properties the results obtained by diamond drilling are not available for publication; consequently attention is here confined to the surface evidences. The replacement ores are sulphides of copper, zinc, iron, lead, arsenic, with gold, chalcopyrite, zincblende, pyrite, arsenopyrite, galena, more rarely pyrrhotite, with oxidation products, chalcanthite and covellite. The massive ore at the centre of the deposits is mainly copper pyrites, banded with zincblende. Towards the margins, copper sulphide gives place to pyrite, which grades insensibly into unmineralized schist. At Flin-Flon lake the ore body strikes slightly west of north, and dips steeply eastwards. The maximum surface measurements of the mineralized zone may be taken as 1,900 ft. in length, and 200 ft. in width, the ore appearing on two points on the east of the lake, covered in part by a small bay between these points, and broken by a large mass of unmineralized rock. The measurements consequently include a good deal of country which is not strictly on surface showings ore body. At Schist lake a very compact deposit is well shown by trenching, with a similar strike and dip to that at Flin-Flon lake. This body is 420 ft. long and 75 ft. wide (maximum measurements) at the surface, with almost solid mass of chalcopyrite and zincblende—25 ft. wide—in the centre, the sulphides grading into pyrite on both sides. There are distinct evidences of shearing and brecciation in the zone in which the ore body has been deposited, and the zincblende has probably been introduced subsequent to movements which have affected the copper sulphides.

An interesting and important feature in connection with these and other sulphide bodies in the district is the extensive weathering of the surface ore. The oxidation is unusually pronounced for a highly glaciated country; even at the bottom of trenches 10 ft. deep the evidences of weathering are general. Where the sulphides are exposed at the surface, they are coated with a red rust, which serves as an indication to the prospector; but owing to the fact that the sulphides have formed in zones of weakness, they have, as a rule, been weathered to a lower level than the surrounding country rock, and are now to be found in the valleys covered by glacial drift, or even by the waters of the lakes. For this reason, only a very thorough prospecting will reveal all the sulphide deposits.

At Sandy lake, immediately west of Herb lake, a fairly extensive sulphide zone has been found near the east end of the lake, practically on the granite contact. Iron sulphide (pyrite and some pyrrhotite), with traces of copper sulphides, occur disseminated through a soft carbonaceous schist.

Sulphide bodies are also reported from Copper lake, Athapapuskow lake and the Pineroot river. While certain of these deposits may be of little economic value, their wide distribution throughout the belt is an encouraging feature, which will undoubtedly stimulate intensive prospecting for copper-zinc sulphides, such as are beng developed at Flin-Flon and Schist lakes.

## ARCTIC COPPER DEPOSITS.

Seattle, Wash., Sept. 14.—Dr. R. M. Anderson has brought back to the United States some data which may prove of value to the copper mining industry. This information he secured in the Arctic region where he commanded a part of the Stefansson expedition. A full report will be made to the Canadian government which financed the trip. Outlining briefly his copper discoveries, Dr. Anderson said:

"We were instructed to survey the copper deposits already known and seek new ones. Every explorer from the earliest times has noted that the Eskimos east of the Mackenzie used knives, spearheads and other weapons and utensils hammered from copper, and the Coppermine river, which empties into the Arctic, got its name from mineral discovered many years ago. We found on Coronation gulf and Bathurst inlet vast deposits of copper of low grade. We were not equipped to undertake mining operations, but upon the sides of cliffs we could measure the depth of successive flows of amygdaloidal lava containing nuggets of copper. An Eskimo brought to us a lump of copper weighing 40 lb. There were seams in the lava that had been filled with pure copper. Our geologist took many samples of rock, which will be assayed. He also made many estimates of the area of ore in sight.

"The ore had many of the characteristics of the Lake Superior copper rock. It is workable from the surface, and is near navigable water. It would be feasible to construct a railroad from the Mackenzie river, which is navigable five months of the year, to Great Bear lake, which also is navigable much of the year. A further railroad line could be built from the lake to the copper fields, enabling the transportation of the ore."

## STANDARD SILVER-LEAD MINING CO.

Information relative to the operations of the Standard Silver-Lead Mining Co. during July, as under, was published on September 12, in Spokane Washington, the head office of the company being in that city:

The company's net operating profit for the month of July was $56,609, as compared with $30,398 for June, $38,437 for May, $86,774 for April and $136,943 for March, which was the banner month for the current year. The company's surplus on July 31 was $296,381, as compared with $289,772 on June 30, $309,373 on May 31, $320,937 on April 30, $284,163 on March 31 and $197,220 on February 29. The dividend disbursements have been $50,000 monthly throughout the year to date.

The company's income is derived from the production and sale of silver-lead and zinc ore and concentrates, much the larger part of its earnings being from its silver-lead products. During July 429 tons of silver-lead ore and concentrate was marketed, as compared with 497 tons in June, 504 tons in May, 729 tons in April and 1,295 tons in March. The statements of ore receipts at the smelting works at Trail, B.C., for the month of August show that deliveries there of silver-lead products by the Standard Co. totalled 763 tons, forecasting a more profitable showing than that of any other month this year, with the exception of that of March.

Recent monthly receipts from the sale of zinc ore and concentrate were as follows: March, $5,432; April, $26,847; May, $18,260; June, $24,808; July, $63,890. The notably larger income from zinc during July was due to the fact that back settlements for a considerable period were made during the month, but not to any considerable increase in the quantity of zinc product marketed during July, the zinc shipments having still been limited to the 500 tons monthly called for under the company's contract with Beer, Sondheimer & Co. Contracts for the accumulated zinc products and for the quantity produced in excess of 500 tons monthly are still the subject of negotiations with the representatives of several zinc smelteries.

The following is a summary of the company's financial statement for July:

**Receipts.**

| | |
|---|---|
| Preliminary settlements for 429 tons of silver-lead ore and concentrates | $47,775 |
| Zinc sales, including back settlements | 63,890 |
| Umpires | 211 |
| Boarding house | 4,696 |
| Total | $116,572 |
| Less, final settlements for May, and zinc penalties for February and March | 17,028 |
| Net receipts | $99,544 |

**Disbursements.**

| | |
|---|---|
| Ore production, including mining, tramming, milling, shipping, marketing, power, general expense, salaries, taxes, etc. | $28,521 |
| Boarding house | 3,607 |
| Development | 3,591 |
| Construction | 3,628 |
| Aylard tunnel | 1,812 |
| Store supplies | 872 |
| Home office expenses | 904 |
| Total disbursements | $42,935 |
| Balance | 56,609 |
| Net operating profit | $99,544 |

**Cash Statement.**

| | |
|---|---|
| Balance on hand, June 30 | $289,772 |
| Net profit for July | 56,609 |
| Total | $346,381 |
| Less Dividend No. 44 | 50,000 |
| Balance, July 31 | $296,381 |

**Recapitulation.**

| | |
|---|---|
| Cash in banks | $219,209 |
| Ore shipped but not settled for | 122,678 |
| Total | $341,887 |
| Vouchers payable and payroll | 45,506 |
| Balance, July 31 | $296,381 |

Metallurgical and Chemical Engineering, of New York city, has been publishing information concerning electro-chemical possibilities on the Pacific Coast as compared with those in Sweden and Norway, and reference was made to the new electrothermal iron reduction which has been developed on a very large scale in Sweden. Writing from London, England, a correspondent contributed to the September 1st issue of that journal some interesting details relative to the situation in Sweden in that connection. Beside giving information, as just stated, the correspondent made this observation: "I venture to say that there is no place in the world where conditions are so exceptionally suitable for electric iron ore reduction as the Pacific Coast of the United States and Canada. If enterprising people went about this affair in a proper way, it should be extremely remunerative and help to develop industry generally." Further comment was to the effect that electric refining of steel has gained much ground in Great Britain during the war, some 40 furnaces having been put in and success had everywhere been conspicuous. A final remark was that "any large electrothermic iron works on the Pacific Coast would be complete only with final electric refining."

## AMERICAN INSTITUTE OF MINING ENGINEERS, ARIZONA MEETING.

### Smelting and Leaching.

Douglas, Ariz., Sept. 19.—The first of the technical sessions of the convention of the American Institute of Mining Engineers, which is meeting in Arizona this week, were held here to-day on the general subjects of "Smelting" and "Leaching." Before the opening of these sessions the several hundred attending members, who are traveling through the State by special train, visited the reduction works of Copper Queen Consolidated Mining Co. and of Calumet & Arizona Mining Co.

A. G. McGregor, of Warren, Ariz., in an address on the "New Copper Smelting Plants in Arizona," told the engineers that in Arizona during the past five years there has been more activity in copper-smelting plant construction than in the same length of time in the history of the world. Mr. McGregor said that in this period five new copper-smelting plants had been constructed and put into operation. The monthly output from these plants, he said, averaged from 5,000,000 to 18,000,000 lb. He then described new problems which had been met successfully and new features in plant design and equipment which had been developed.

At the evening session on "Leaching," Frederick Laist and Harold W. Aldrich described the 2,000-ton leaching plant at Anaconda, Mont. A paper on "Possibilities in the Wet Treatment of Copper Concentrates" was read by Lawrence Addicks, and "Leaching Tests at New Cornelia" were discussed by H. W. Morse and H. A. Tobbelmann. In the course of the day's proceedings John C. Greenway welcomed the members to Arizona, and L. D. Ricketts, president of the Institute, responded for the delegates.

The party left to-night for Bisbee, where to-morrow's sessions will be held. Mining and Geology will be the subjects to be taken up in the technical discussions.

### The Manganese Shortage.

Bisbee, Ariz., Sept. 20.—A further handicapping of the chemical industries and the paint and dye manufacturing interests of the country, due to a lack of manganese ores, was predicted here to-day during convention sessions of the American Institute of Mining Engineers, which is meeting in Arizona throughout this week. This statement was contained in a paper by E. C. Harder, of the U. S. Geological Survey, presented to the Institute members for discussion.

Mr. Harder's treatise explained that even at the beginning of the European war there had been a great decrease in imports of both ores and alloys of manganese, and that since 1914 the price had risen from $37 per ton to $100 per ton, with ferro-manganese selling considerably higher.

Said Mr. Harder: "The situation in the United States, at the present time, regarding the supply of manganese ores and alloys of manganese is one of great seriousness and is likely to become increasingly so while the European war continues. The dependence of the country upon foreign countries for this supply is being forcibly indicated."

Another feature of the sessions was the statement in a paper by David B. Reger, of the West Virginia Geological Survey, to the effect that "the exhaustion of oil and gas in the United States is proceeding at a rapid pace." Mr. Reger predicted that this problem will first be partially solved by the securing of deeper producing horizons in the high-grade oil regions and later by the possibility of mining deep sand oil and gas.

Other papers attracting considerable attention of the delegates were "The Geology of the Warren Mining District," by Y. Bontillas, J. B. Tenney and Leon Feuchere; "Co-operative Effort in Mining," by Joseph P. Hodgson, and "Gold and Silver Deposits in North and South America," by Waldemar Lindgren.

In this last paper Dr. Lindgren stated the conclusion that the South American mineral resources in precious metals are less than those of the northern continent, and that "even progress and enterprise will be unable to raise its production to approach the figures attained by North America."

The several hundred Institute delegates left here to-night for Globe, where Thursday's and Friday's sessions will be held.

### The Future of the Flotation Process.

Globe, Ariz., Sept. 21.—Possible means of developing the flotation process to the greater benefit of the country's mining interests were taken up in the sessions of the American Mining Institute of Engineers, meeting here to-day.

Conclusions reached by the delegates, who include representatives of twenty of the leading metal producing companies of the country, were to the effect that the flotation process is now in its infancy, and that with the further discovery of new flotative agents and generous expenditures, a brilliant future record could be obtained for this process.

During a part of to-day the mining experts visited the mines of Old Dominion Copper Co. and later visited the reduction works of this company. During the evening technical sessions were held on the subject of "Fine Grinding," in which F. C. Blickensderfer, of the Detroit Copper Mining Co., described a comparative test of the Marathon, Chilian and Hardinge mills.

To-day's flotation discussions were particularly important to mining interests because of the first public presentation of a report of experiments on several miscellaneous wood oils which seem adaptable to use in the flotation process. A statement of some of the values of these oils was presented by R. C. Palmer, of Madison, Wis.; Glenn L. Allen, of the Shattuck Arizona Copper Co., and O. C. Ralston, of the U. S. Bureau of Mines.

Another especially striking feature of this discussion was a description by Dr. Rudolf Gahl, representing Inspiration Consolidated Copper Co., of the exhaustive research and experiment of his company in an effort to develop the flotation process. Said Dr. Gahl: "The flotation process is in its infancy. In what direction future changes may take place is perhaps indicated by tests which have been made partly on a laboratory scale and partly on a somewhat larger scale. The fact that the Inspiration Company has been able to design a commercially successful flotation plant must be attributed to the policy of spending great sums of money for the purpose of investigating the flotation process on a commercial scale."

### Predicts Gasoline Shortage on Pacific Coast.

Globe, Ariz., Sept. 22.—A serious gasoline shortage on the Pacific Coast, the effect of which would extend throughout the entire country during the next year, was predicted here to-day during the closing sessions of the 113th meeting of the American Institute of Mining Engineers, assembled in Arizona throughout this week.

W. R. Hamilton, of San Francisco, presented the gasoline industry data to the engineers. According to Mr. Hamilton, the only possible means of increasing gasoline production are by increased production of either light oil or casing-head gasoline, lowering the grade of market gasoline, or by successful innovations in refining methods. Most of these solutions Mr. Hamilton explained as impracticable in the immediate future, although stating that, by lowering the grade, production could be increased 30 to 50 per cent. He attributed the future gasoline shortage to decreased production of refinable oil (the decrease amounting to 6,000,000 barrels in 1915), steadily increasing consumption, the discontinuance of imports and the heavy exports due to the war demands.

### Chemistry and Coal Mining.

During the course of to-day's meeting the mining engineers heard the value of chemistry to the coal mining industry, in a paper by Edwin M. Chance. Mr. Chance's conclusions showed that Americans have in the past been purchasing coal on its looks rather than because of its heating power. He made public results of experiments which showed dull appearing coal to have better heating and burning properties than the bright coals which have formerly demanded premiums in the market. It is said that this discovery will greatly help to offset the cost of coal production without materially increasing the costs to the consumer.

Other noteworthy papers to be presented were "Mine Fire Methods Employed by the United Verde Copper Co.," by Robert E. Tally, and "Stoping Methods of Miami Copper Co.," by David B. Scott.

To-morrow the engineers will leave Globe in a fleet of 100 automobiles for a day's tour of the Apache Trail and an inspection of the Roosevelt dam, probably the greatest engineering feat of its kind in the world. The trip will be resumed by special train at Phoenix to-morrow night, and Sunday will be spent at Grand Canyon. Since its start from New York City on September 14th the eastern party has visited practically every important mining centre of the Southwest.

## POTASH FROM SILICATES.

W. C. Phalen in a report on potash, published by the U. S. Geological Survey, says:

The subject of the extraction of soluble potash salts from the silicates, such as feldspar, leucite and sericite, and from greensand has been discussed ever since the question of a domestic supply of potash was broached. Many patents for such processes have been issued, but the problem of doing the work at a profit is still to be solved. One difficulty is the location of large deposits of uniformly high grade material. Large deposits of feldspar of uniformly high grades are not plentiful. Of leucite and greensand there is abundance; and the supplies of greensand especially are very accessible. Whether the greensand will prove to be of sufficiently high grade or whether it can be brought up to workable grade is not known.

All processes for extracting potash salts from the silicates include both the mining and transportation of raw material, and also the accessory materials needed for the reactions. Further, in the practical manipulation of all the processes devised, there is generally involved fusion, sublimation, extraction, filtration, concentration, crystallization, drying, grinding, sorting and bagging, a series of operations which will make potash so expensive that under normal trade conditions it can never hope to compete successfully with German potash salts at the prices at which they can be sold in this country.

W. H. Bowker has said that: "The (German) potash industry has been one of the most profitable in the world. It is said that muriate of potash, the standard grade (50 per cent. $K_2O$), can be mined and delivered

at the seaboard of this country for $15 a ton and show an handsome profit. I am told that it was stated in debate in the Reichstag in 1910 that the best mines in Germany could mine the mineral and refine it for about $8 a ton. The price in cargo lots is from $33 to $34 per ton delivered at seaboard. Through the German Kali Syndicate the production of the mines is limited by allotment and the price is arbitrarily fixed. It is stated that there have been more than a hundred well-equipped mines, with a capacity equal to six times the world's consumption."

Only those who have experimented with the process of deriving potash salts from the silicate rocks and minerals on a large scale are in a position to speak with authority on costs, and not much has been published on this phase of the work. A. S. Cushman and G. W. Coggeshall have discussed costs and estimate at $28.80 per ton the cost of potassium chloride of 80 per cent. grade (50 per cent. $K_2O$). This corresponds to a cost of 2.88 cents per lb. of $K_2O$. If German potassium chloride of the 80 per cent. grade can be delivered at our seaboard for $15 per ton and show a handsome profit, the hope for the successful establishment of a domestic potash-salts industry near the Atlantic seaboard, except during abnormal times like the present, seems rather remote. The farther inland and the higher the freight rates the better the opportunity for a domestic industry to compete; but the fact must be borne in mind that the largest domestic consumption of potash salts is in the Eastern and Southeastern States, where freight rates from seaboard cities to inland points are not high.

In the preparation of soluble potash salts from the silicate rocks, especially for the fertilizer trade, which consumes more than 90 per cent. of the imported material, the problem is not necessarily one of extraction of the pure salts, though the demand for these is acute in certain branches of the chemical industry. If the potash is rendered soluble in the mass, this mass can be used in mixed fertilizers. A product, however, of too low grade will not be in demand when conditions are normal, for the trade in German potash has resulted in a demand for the higher grades.

A fact worthy of serious consideration is that most of the processes devised will yield by-products of value; indeed, the obtaining of a by-product of value may be the determining factor between profit and loss in practically all of them.

## A NICKEL DEPOSIT IN CALIFORNIA.

In a bulletin published by the U. S. Geological Survey, Mr. F. C. Calkins says of the nickel deposit in California, which he examined last December:

The deposit is the property of the Friday Copper Mining Co., in which Beecher Sterne, of San Diego, is one of the principal owners. It lies near the main highway about four miles south of Julian, a village about 60 miles northeast of San Diego, with which Julian is connected by two or three automobile stage lines.

The Friday claim was located about 30 years ago, in the belief that it contained a vein of copper, and owing to the slowness with which development went forward the nickeliferous character of the ore was not discovered for some years. It is worth remarking that the famous Copper Cliff mine at Sudbury, Ontario, and the Gap mine, in Lancaster county, Pa., had in this respect a similar history. The workings at present consist of a shaft about 250 ft. deep and several drifts. The drifts at about 200 and 250 ft. from the surface are each about 200 ft. long; the others, which are shorter, are blocked by rock falls.

The ore of the Friday property consists mainly of pyrrhotite, but contains pyrite, chalcopyrite, and an iron-nickel sulphide, and is accompanied by small quantities of amphibole and of a carbonate that is probably calcite. When the ore is viewed with the naked eye, pyrrhotite alone is conspicuous.

The fresh sulphides were found only at considerable depth below the surface. The outcrop of the vein is a spongy gossan, consisting chiefly of limonite, and a small amount of material rich in malachite was found between this and the unoxidized ore. Oxidation, which is perhaps especially favored by the closely spaced partings in the pyrrhotite, attacks vigorously the ore thrown on the dump and develops enough heat to char wood. Its chief products, in the first stage, are sulphates, which are readily dissolved, so that much of the nickel and copper must have been lost from the accumulated ore.

The ore can not be said to have a gangue in the proper sense of the term. The minerals intimately mingled with the sulphides are almost negligible in quantity, though the ore is more or less mingled with country rock at the margins.

No assays or chemical analyses of the ore have been made by the Geological Survey, but several have been supplied by the company. These, on their face, indicate a wide variation in the nickel content, the percentages reported ranging from 2.94 to 22.95. The higher figures, however, are not confirmed by the appearance of the ore that was examined. It seems, on the other hand, as if considerable reliance might be placed on the figures given in two fairly detailed analyses by well-known eastern firms, namely, 4.34 and 4.12 per cent. Both these analyses report gold and silver to be absent, though the assays giving the highest figures for nickel report them as present in weighable amounts. Copper, according to the assays, ranges from a trace to 2.4 per cent. Platinum, whose possible presence in traces at least is suggested by the geologic relations of the ore, apparently has not been looked for.

Regarding the form of the ore body, and its detailed relations to the country rock, only partial evidence was gathered by examination of the one accessible drift in which the ore is exposed. The observations indicate that the ore forms a chimney-like body of steep inclination, partly bounded by slips. The mass does not appear to be sharply defined except where there is indication that it is faulted. It lies near the contact of gabbro and schist, but is partly enclosed in gabbro.

## PROSPECTING FOR NICKEL.

The E. J. Longyear Co. has during the summer been carrying on a diamond drilling campaign in the Sudbury district. It is reported that some good ore has been encountered on claims east of the Garson mine. The extent of the deposits is as yet unknown.

The company is spending a large sum of money in its attempt to find ore, and it is to be hoped that important deposits will be found.

The E. J. Longyear Co. of Minneapolis, Minn., are exploring engineers and geologists, diamond drill contractors and manufacturers of diamond drills and supplies. We have not been advised whether the prospecting campaign now under way in the Sudbury district is on behalf of the Longyear company or under contract with other interests.

## THE "SNEER" ZONE.

The "Toronto World" on Sept. 24 printed the following:

The graduating class of a mining college decided to spend the summer prospecting in order to gain practical experience. They went to a well-known mining engineer for advice, a man who is both optimistic and conservative.

"Where had we better go to prospect?" they asked.

"Well, I'll tell you the most likely place. Go into the 'sneer zone' round any established mining camp. Every camp has its 'sneer zone.' It is the place where all the wise miners and engineers refuse to look for mineral, and insist that nobody but a fool would expect to find anything. The 'sneer zone' is virgin territory, and you'll have as good a chance there as in any place, and usually better."

As a gold mining field Canada was all in the "sneer zone" a few years ago. Very rich placers had been worked, first in British Columbia, and later in the Klondike, but lode mining had been for the most part a dismal failure. There was not a single mine of the front rank in the whole Dominion. (What about Rossland and Hedley?). Now we have at Porcupine one mine paying 13 per cent. per annum on an issued capital of $24,000,000, and when the enlargements of the plant are completed the earnings will be over 20 per cent.

The Croesus, in Munro, was hawked about Toronto for over a year, and turned down by more than one gentleman "from Missouri." The ore was too dazzling. Mining engineers are accustomed to seeing more quartz than gold, and values of $40,000 per ton left little room for gangue or waste. But eventually a venturesome buyer paid $75,000 for the property, and now there is $3,000,000 in sight. The mine has produced some of the richest samples ever seen in Canada. Imagine the feelings of the "Missourians" who relegated this wonderful property to the "sneer zone."

In the early days at Cobalt the Crown Reserve was in the discard; in fact, totally eclipsed by the glamor of the "silver sidewalk" on the Lawson. The $1 shares could not be marketed at 10 cents each. But underneath the mud and water of Kerr lake, within a stone's throw of the spectacular outcrop on the Lawson, there was $10,000,000 in silver in the Carson vein 200 feet from the surface. This was the great bonanza of Cobalt. When discovered the shares went over $5, and several fortunes were made over night. The Lawson was famous over half a continent. Even the men "from Missouri" were convinced of its richness, but its production has been only a tenth of the Carson vein.

It is, therefore, plain that mining experts sometimes make mistakes, and the precious metals are occasionally found in unexpected places. A property is not necessarily worthless because it has been abandoned. Even in the Sudbury nickel field properties have been examined and rejected by supposedly competent experts a dozen times. Hardly any two mining regions or any two properties in any region are exactly alike, therefore, it is unwise to sneer.

Often failures have resulted because work was done in the wrong place, or in an unskilful manner. In fact, there has been a great deal of perfunctory mining without proof that the properties operated are either good or bad. Much more capital is required, but that is assured after the war, and large capital is generally combined with skill. Owing to the wide pre-Cambrian area in Canada there is a great future for the mining industry.

## DOME MINES.

The report of Dome Mines, Ltd., for the month of August shows that there was milled 40,010 tons ore. The bullion produced is valued at $180,000. The cost was $2.56 per ton, made up as follows: mining, 75 cents; development, 60 cents; milling, 81 cents; general, 31 cents.

September is expected to show a large tonnage milled. In spite of the fact that the grade of ore is low, the company is accumulating a surplus while paying regular dividends.

## BOOK REVIEWS.

**The Flotation Process—by Herbert A. Megraw—McGraw-Hill Book Co., New York—Price $2.50—For Sale by Book Department, Canadian Mining Journal.**

In this book Mr. Megraw presents information gathered from his practice and consultation, which is a valuable contribution to the literature on the flotation process. An endeavor has been made to state the known facts rather than to speculate on them.

The chapter headings are: Concentration by flotation, patent record, theory, oils and their uses, processes and apparatus, testing ores, testing at Anaconda mill, applications, examples of practice, operating plants, concentration at Anaconda, practice and place in metallurgy.

Mr. Megraw defines flotation concentration as "the taking advantage of the principles of surface tension and colloid chemistry, with whatever allied principles may be involved, to separate mineral from gangue by means of floating it upon the surface of water or other solutions, while the gangue is induced to sink through the surface and settle separately."

The way in which the principles referred to may be utilized is the metallurgist's problem. Mr. Megraw helps in this little book to point out the way.

**The American Petroleum Industry—by Raymond Foss Bacon and William Allen Hamor—with Special Chapters by F. G. Clapp, Roswell H. Johnson, J. P. Cappeau and L. G. Huntley—McGraw-Hill Book Co., New York—Price $10.00—For Sale by Book Department, Canadian Mining Journal.**

This excellent treatise is a very welcome one, for good books on the American Petroleum Industry are scarce. The work is a comprehensive one of 963 pages, published in two volumes. The authors are the director and the assistant director of the Mellon Institute at Pittsburgh.

The chapter headings of Volume I. are: Geochemistry, geology, distribution in United States, physical and chemical properties, history of the industry, oil well technology, valuation of properties, commercial factors involved in appraisement, causes of decline of wells, efficiency in production, condensation of gasoline from natural gas.

In Volume II. the chapter headings are: Refinery technology, engineering, hygienic considerations, some problems of the industry, the shale-oil industry, glossary of bitumenology.

The authors have endeavored to present a comprehensive survey of the American petroleum industry. This was a tremendous task, but has been successfully accomplished, and the volumes may be consulted profitably by anyone interested in petroleum.

# PERSONAL AND GENERAL

Mr. Ralph Scott, formerly of the Dome mine staff, is now manager of the feldspar mine at Verona, Ont.

Mr. C. H. Hitchcock is in The Pas district, Manitoba.

Mr. Geo. T. Holloway and Mr. T. W. Gibson, of the Ontario Nickel Commission, have been at Sudbury and Cobalt this week holding public meetings for discussion of the nickel problem.

Mr. R. W. Atwater, of New York City, consulting engineer for Ladenburg-Thalman & Co., has been on a professional visit to the Coeur d'Alene district, Idaho. Years ago he was manager of the Ymir gold mine in British Columbia.

Mr. Geo. H. Aylard, of Victoria, B. C., general manager of the Standard Silver-Lead Mining Co., operating near Silverton, Slocan, was in the Bridge River region, Lillooet district of British Columbia, last month looking at some lode-gold properties.

Mr. H. C. Bellinger, a metallurigst well known in British Columbia, recently spent a short vacation with his family on his farm near Kiesling, Northeastern Washington. He has since proceeded to New York City, en route to Chile, in which last-mentioned country he has charge of the smelting works and metallurgical operations of the Guggenheim Exploration Co.

Mr. J. Edward Berg is manager of the Pueblo mine, in Whitehorse copper camp, Southern Yukon.

Mr. W. A. Carlyle was at Butte, Montana, in the early part of September.

Mr. Henry Clark, Canadian manager for Head, Wrightson & Co., of Stockton-on-Tees, England, bridge and mining machinery manufacturers, left Victoria, British Columbia, early last month to proceed to the firm's headquarters in England on business.

Mr. A. C. Garde, formerly manager of the Payne mine, in Slocan district of British Columbia, and for several recent years having his headquarters at Prince Rupert, the western terminus of the Grand Trunk Pacific railway, left the latter place on September 5th for Smithers, in Omineca division and near the railway, to take charge of the development of a mining property on which the occurrence of silver-lead and antimony ore has been reported.

Mr. Wm. Gardner, of London, England, secretary of the Tyee Copper Co., is at Ladysmith, Vancouver island, B. C., in connection with efforts being made to arrange for a resumption of smelting operations at the company's copper smeltery at Ladysmith.

Messrs. G. H. Garry and R. J. King, of the Tonopah-Belmont Co.'s mining engineering staff, were at Prince Rupert last month, having been investigating the mining situation in parts of British Columbia tributary to that town.

Mr. J. Cleveland Haas, of Spokane, Washington, consulting engineer to a company that is engaged in developing a group of mineral claims situated near Ainsworth, B. C., was on the property in the latter part of August, ascertaining progress and advising as to further development work. Mr. W. A. Harvey, a Slocan district old-timer, is resident superintendent.

Mr. Chas. Hussey, of Spokane, at the head of the business department of the Standard Silver-Lead Mining Co., after having spent a three weeks' vacation motoring in the Yellowstone Park and other parts of Montana, recently went to the company's mine, near Slocan lake, B. C., where the latest important development reported was the opening of a big shoot of galena ore on the Alpha claims of the large group owned by the company.

Mr. H. H. Johnstone, for some years head underground boss in the Consolidated Mining and Smelting Co.'s Centre Star-War Eagle group of mines at Rossland, B. C., after having for the last three months been acting district inspector of mines during the absence on sick leave of Inspector Jas. McGregor, has been added to the permanent mine-inspection staff of the British Columbia Department of Mines, the considerable increase in metal mining in Kootenay and Boundary districts making the services of another mine inspector necessary.

Mr. Arthur Lakes, Jr., of Spokane, Washington, last month paid a visit to the Bayonne region, in the southeastern part of Nelson mining division of British Columbia, in which is situated the Spokane group of mineral claims, owned by Laib Bros., who have during the last two months been sending out gold-silver ore nine miles by pack train and eleven miles thence by wagon to the Nelson-Spokane railway at Salmo. Mr. W. R. Salisbury, of Salmo, who formerly leased the Hudson Bay zinc mine and shipped much ore from it to the United States, has arranged to continue the development of the Spokane group under an option of purchase.

Mr. A. G. Larson recently returned to his headquarters at Spokane from a trip to Colorado and other parts of the United States, during which he gave attention to the business of finding a market for concentrate from the Lucky Jim zinc mine, in Slocan district of British Columbia, which for nearly a year has been operated profitably under his direction.

Mr. C. O. Lindberg, of Los Angeles, California, has been investigating the zinc ore resources of Kootenay district of British Columbia, and obtaining information relative to the smelting or other reduction of zinc ores in that district.

Mr. J. F. McKenzie, of the International Molybdenum Co., of Renfrew, Ontario, has been examining the Molly molybdenite mine, on Lost creek, Nelson mining division, British Columbia, on which 16 men are employed doing development work, with Mr. J. R. Rutherford in charge.

Mr. E. J. Montgomery, assistant superintendent of the Centre Star-War Eagle mines, Rossland, B. C., left that place early in September for a holiday visit to Montreal, Quebec.

Mr. Robert Musgrave, of Victoria, B. C., was in East Kootenay district last month, investigating a number of mining properties for the British Columbia Department of Mines. He is expected to shortly visit mining camps in the Hope and 23-mile region of Yale district.

Mr. Fred. S. Peters, superintendent of the Le Roi mine, left Rossland, B. C., on September 11th to pay a visit to his old home in Nova Scotia.

Mr. M. E. Purcell, superintendent of the Centre Star-War Eagle group of mines at Rossland, B. C., a short time ago spent several days in the Coeur d'Alene district, Idaho, and while there visited some of the larger silver-lead and zinc mines which are being energetically and profitably operated.

Mr. J. V. Richards, of Spokane, recently examined a mining property near the northern end of Kootenay lake, British Columbia, for a prospective purchaser from that city.

Mr. W. Fleet Robertson, of Victoria, B. C., provincial mineralogist, was in Lillooet district during the first part of September, examining mining properties in country about Bridge river.

Mr. F. H. Skeels is manager of the Kootenay Gold Exploration Co., the organizers of which a few weeks

ago acquired the Granite-Poorman group of gold mines, near Nelson, British Columbia.

Mr. Trevor W. Starkey, of Nelson, B. C., has been on a five weeks' trip through the Lardeau and Upper Duncan regions of West Kootenay, examining mining properties for United States men.

Mr. F. M. Sylvester, general manager for the Granby Consolidated M., S. & P. Co., was recently on a visit to Spokane, Washington, where he resided for some time prior to his removal to Vancouver, B. C.

Mr. D. J. Williams, manager for the Rocher Deboule Copper Co., near New Hazelton, Omineca mining division, British Columbia, was at Edmonton, Alberta, last month.

Mr. Chas. H. Young, of the Geological Survey of Canada, was at Lillooet, British Columbia, in the last week in August.

Mr. Will Haylmore, superintendent at the Coronation gold mine, on Cadwallader creek, in the Bridge River section of Lillooet district, British Columbia, has joined the 6th Field company, Canadian Engineers, for service overseas.

Mr. J. M. Williams, manager of the McGillivray Mountain Mines, Ltd., in Lillooet district, British Columbia, reported lately that much development work was being done on mining properties and that another vein of copper ore had been found.

Mr. Frank M. Estes, who has been representative in the northwest of the American Smelting and Refining Co., with headquarters at Spokane, Washington, left that city on September 12th for New York, on his way to Chile, where he is to be South American manager for the same company. His successor at Spokane is Mr. Preston Locke.

### KITCHENER'S WARNING.

In every man's life there is one supreme hour towards which all earlier experience moves and from which all future results may be reckoned. For every individual Briton. . . . that solemn hour is now striking.

These words, uttered by Lord Kitchener, not long before he made the last great sacrifice for Britain's sake, apply not only to those who are able to take up arms and those who can directly assist in maintaining our divisions on the firing line, but as well to those whose opportunity it is to lay, broad and deep, the foundations of the national economic structure which must be built up after the war. We cannot raise a worthy and enduring building on hastily made or inadequately planned foundations. We must plan now; we must "get our footings" now on the bed-rock of sound principles and thorough organization.

The Bannockburn property, in the upper Duncan river region, an outlying part of Ainsworth mining division, in the northwestern part, has been bonded by St. Paul men, who in August sent in six or seven men to do necessary preliminary work, such as surface stripping, camp construction, etc. The trail from the Red Elephant to the Bannockburn has been put in order, but transportation facilities are insufficient to admit of much mining work being done during the remainder of this season.

The first car of ore from Messrs. Brown & Jordan's claims was shipped from Keremeos, in the Similkameen valley, on August 28th. It was consigned to the Granby Consolidated Co.'s smelting works on Grand Forks, Boundary district.

A strike of copper ore in the Babine country, Omineca mining division, 23 miles from Hazelton, has been reported, but no particulars have been published.

## SPECIAL CORRESPONDENCE

## COBALT

### Little Nipissing.

There is some possibility that the old leases ground of the Little Nipissing from Peterson Lake may prove one of the so-called "come-backs" of the camp. About a month ago, what is known locally as the Detroit Syndicate, took over this ground, which is better described as being the northern portion of the Peterson Lake property. A start was made at once in de-watering the old workings to the 155 ft. level. This work is now about completed, and the task was a heavy one, as the flow from the old Peterson Lake workings, those of the Seneca Superior from No. 1 shaft, and the Little Nipissing property were all connected and extended nearly a mile in length. Once the water is clear to the 155 ft. level, however, a cement bulkhead will be put in, and the leased ground cut off from the other. An examination of the old workings showed considerable low grade ore in the stope at the 100 ft. level. An assay made across the stope at one gave 106 oz. to the ton. A few samples of high grade were found about 50 ft. from the surface. It is expected that a considerable tonnage of this low grade rock can be taken out and milled at a profit.

### Red Jacket.

About two months ago a syndicate of local men took a lease from the Temiskaming Mining Co. of the old property of the Red Jacket Mining Co., about two miles south of the McKinley-Darragh property. The old workings were accordingly pumped out and an examination made. The engineers who made the examination, however, did not report favorably upon the property, and the idea of carrying out the plan of exploration outlined was dropped. The workings are now almost full of water again.

### Calumet and Montana.

The Calumet and Montana Consolidated, which has a lease on the old Cyril Lake property, is pushing a crosscut at the 90 ft. level of the present workings to cut the extension of what was known as the Bilsky vein on the old Nova Scotia property. The undertaking requires about 250 ft. or more of crosscutting, but more than half of this has been completed now. On the 50 ft. level the company got some high grade ore and some mill rock was cut through, which it is thought can be milled at a profit.

### Chambers-Ferland.

Chambers-Ferland will have another carload of high grade ore assembled for shipment about the first of October. The company estimates that there is at present in sight about 10,000 tons of low grade ore and mill rock. Shipments of this will be started to the Northern Customs concentrator as soon as the latter company is ready to receive it. A contract has already been made with the latter company. Underground a crosscut is being run to connect up all of the winze work, and in the progress of crosscutting the extension of the Nipissing No. 64 vein will be cut through by about the first of next month. This vein was cut on one of the upper levels last winter, but as this was not in the ore horizon it was not a disappointment to

the company when no values were found. On the 425 ft. level the company is mining high grade in the new veins found last winter, and there is reason to hope for good results on the No. 64 vein at the same level.

## NOVA SCOTIA

**Dominion Coal Outputs.**—The monthly production of the Dominion Coal Co.'s collieries compares with 1915 as follows:

| | 1915. | 1916. |
|---|---|---|
| January | 287,000 | 407,000 |
| February | 312,000 | 396,000 |
| March | 364,000 | 411,000 |
| April | 357,000 | 378,000 |
| May | 472,000 | 383,000 |
| June | 481,000 | 365,000 |
| July | 498,000 | 360,000 |
| August | 443,000 | 352,000 |
| September | 452,000 | *345,000 |
| | 3,666,000 | 3,397,000 |

*Estimated.

Decrease of 269,000 tons.

It will be noticed that every month this summer has shown a decline from the preceding month, and the tendency is still in a falling direction. It appears probable that the output for the year will total about 4,100,000 tons, or 500,000 tons below the production of 1915, notwithstanding that up to the end of the half-year the production figures were well in advance of those of 1915. During the five summer months, May to September inclusive, it will be seen that the outputs have fallen below those of the corresponding months of 1915 by no less than 541,000 tons, and if an estimate is made of the falling-off that may be anticipated for the period, October to December inclusive, the total drop below the 1915 capacity will be in the neighborhood of 900,000 tons. Shortage of men is the sole reason for the decline, and enlistments is the chief and practically the only reason for the shortage of men.

### The Need of Men.

The shipment of Nova Scotia coal to St. Lawrence ports is this year badly affected by the decreased production of coal in the province. The actual shipments this season will be less than one-quarter the normal tonnage, and less than in any year since about 1894. When, very recently, a national strike of railwaymen was threatened in the United States, it was stated that Ontario had about one month's coal supply on hand, and some newspapers sought to allay popular anxiety on the score of coal supply, by intimating that it would be possible to bring in coal from the Maritime Provinces to replace the shortage in United States importations. How little there is in this possibility the foregoing facts and figures will show very plainly.

On several occasions your correspondent has pointed out the dangers from a national point of view of allowing the working forces at the collieries in Nova Scotia to be depleted, and the unwisdom of allowing Canada to become too wholly dependent on the United States for coal supply. There is no parallel in any of the belligerent countries, on either side, of so great a decline in coal production as has been allowed to take place in Nova Scotia since the commencement of the war. On the contrary, every effort has been made by the governments at war to increase the production of coal, particularly bituminous coal, because, as has been pointed out in these columns in almost monotonous reiteration, it is the basic munition of war.

So little is the need for coal realized, however, that during August somewhere in the vicinity of 1,800 men left the Maritime Provinces to harvest in the West. At least 800 of these men were taken from the mines and munitions plants of Nova Scotia, and a great many of these men were carried out of Nova Scotia on the Government railroad. The rate quoted to harvest excursioners is so low as to be practically a subsidized rate, and it cannot be denied that such a wholesale movement of men at cheap rates on Government-owned and Government subsidized railroads places the responsibility for the movement upon the Government itself. When, after allowing the working forces at the mines to be depleted by recruiting to the extent indicated by the falling off in production previously referred to, the Government allow a further depletion of the workers by sanctioning harvest excursions from Nova Scotia, it is imposible to escape the conclusion that the authorities do not realize the necessity of coal at the present juncture.

## BRITISH COLUMBIA

Dividend payments by mining companies operating in British Columbia are expected to total about $3,500,000 for 1916 as compared with $3,276,151 for 1914 and 1915 combined. Payments to October 1st, which will include the recently declared dividend of the Consolidated Mining and Smelting Co. and that of the Hedley Gold Mining Co. for the third quarter of the year, which latter is expected to be announced before the end of September, will total $2,405,000, with a possible addition not yet made public.

Two small shipments of ore have been received at Trail lately from Port Arthur, Ontario. While the quantity is not large, it is noteworthy that even two or three carloads of ore should have been sent such a long distance to western reduction works.

While it is yet too early for particulars of the season's yield of placer-gold in the province to be ascertained, it is of interest to know that the outlook is favorable for an average total in value. Some notes on mining in Cariboo and Atlin districts follow.

### Cariboo.

Drilling operations have been resumed in gravel beds in the neighborhood of Barkerville, with the object of ascertaining whether the quantity of gravel and its gold content are such as to warrant the establishment there of a gold-dredging enterprise. Mr. John T. Towers, who is stated to represent Boston capitalists, operated a Keystone drill on Williams creek and Willow river in the seasons of both 1914 and 1915. In his annual report for the latter year the district Gold Commissioner said: "J. T. Towers operated his drill on Willow river in the vicinity of Mosquito and Cornish creeks, and on the lower Willow river below Slough creek. For reasons needless to mention, the results of the drilling are not made public; however, I do not think that they were discouraging, and feel fairly confident that they proved there is a considerable yardage of dredging ground in these parts." Another drill was also operated last year, by the Yukon Gold Co., first on Antler creek, then on Williams creek, afterward on Willow river, and still later on Lightning creek. Concerning the work done with this drill, the Gold Commissioner reported, in part: "The first cross section was drilled practically over the upper line of the old

Tinker and Cameron claims, two of the richest claims in the old days. It was out of these two claims that the late 'Cariboo Cameron' took so many thousands of dollars in the early days." Other cross sections were also obtained in the neighborhood of Barkerville.

### Atlin.

The Daily Alaskan, published at Skagway, through which port travel to and from Atlin passes, a few weeks ago, included in its comments the following reference to Atlin: "We are happy to learn that Atlin and the interior are building a good solid foundation for business, and that mining is forging to the front in that part of the country."

When in Skagway at the end of August, Mr. J. M. Ruffner, a pioneer mining operator in Atlin district, where for years he was manager for the North Columbia Gold Mining Co., one of the largest gold-producers in that region, told the Daily Alaskan that things are moving in the Atlin district; the town of Atlin, which was nearly destroyed by fire last spring, is being rebuilt, and a general tone of prosperity seems to have settled over the camp. Mr. Ruffner himself had been operating a hydraulic property at the head of Spruce creek, but a shortage of water for sluicing had necessitated his suspending gravel washing for this season. From a drift mine he is operating on lower Spruce creek he is getting good pay.

The Engineer lode-gold mine, Mr. Ruffner said, continues to produce good ore, and indications point to a maintenance of activity at that mine. Prospectors are working in various parts of the Atlin district and finds of ore are reported from time to time. A shortage of labor has prevented more progress being made in some of the mining camps, in which higher wages are being paid than ever before. Plenty of work can be found by miners, if they are good workers and willing to buckle into the game. While most of the surface mines will be closed during the winter, a number of drift mines will be worked throughout the cold-weather season. Altogether, Atlin district is enjoying one of the best seasons it has ever experienced.

### Omineca.

The Silver Standard Mining Co. is stated to have shipped six cars of zinc ore to the Kusa Spelter Co., Oklahoma, the net receipts for which are given as having been $8,700. Receipts of silver-lead ore from this company's mine on Glen mountain, a few miles from Hazelton, at the Consolidated M. & S. Co.'s works at Trail in 1916 to the end of August have been 448 tons. An idea of the average metal contents of ore from this mine can be obtained from its shipments in 1914, when 736 tons gave a return of approximately 200 oz. gold, 122,000 oz. silver, and 282,000 lb. lead.

The Omineca Herald quotes Supt. D. J. Williams, of the Rocher Deboule Copper Co., operating on Rocher Deboule mountain, at the head of Juniper creek, about ten miles from Skeena crossing on the Grand Trunk Pacific railway, to the effect that the company has about 3,000 tons of ore tied up owing to lack of transportation facilities, both railway to the coast and shipping thence to a smelter. This year ore has been going to the smelting works near Tacoma, Puget sound, Washington. The published official report for last year stated that the company's mine, then under lease to the Montana Continental Development Co., from May 17th to December 12th, inclusive, shipped to the Granby Consolidated Co.'s smelting works at Anyox 17,000 tons of ore averaging about 8 per cent. copper and $1.65 gold and 50 cents silver to the ton. Buildings erected, machinery and plant installations then completed, and other improvements then consisted of a two-story bunkhouse accommodating 96 men, steam-heated and electric-lighted, with two large reading-rooms and two rooms for drying clothes, the latter supplied with shower baths for men's use; a compressor-building and machine-shop; a 175-h.p. distillate engine for use in connection with water-supply purposes in the winter; an electric hoist to take men and supplies from camp to mine; a steam locomotive to haul ore from mine to upper terminal of the aerial tramway; laundry and mine and office buildings, etc. In the mine much development work had been done, and preparations were being made for sinking to the 500-ft. level.

### West Kootenay.

**Ainsworth**—Shipments of ore from the Consolidated Mining and Smelting Co.'s Highland mine were larger in August than from all other mines in the division combined. The Comfort lead mine, on the east side of Kootenay lake, shipped 137 tons; the Florence Mining Co.'s Hope mine, 84 tons; the Utica, 142 tons, and several small lots together made up 58 tons. Against these the total from the Highland was 441 tons. No ore was shipped from the Bluebell during two months, but it is expected shipment will shortly be resumed, repairs and renewals to the water-supply line, damaged during June by floods, having been completed.

**Slocan**—Shippers of silver-lead ore from this division are the Galena Farm, Hewitt, Idaho-Alamo, Lucky Thought, Lucky Jim, No. 1, Rambler-Cariboo, Slocan Star, Standard, and Wonderful. Several mines have also shipped zinc ore, but that has been consigned to smelting works in the United States. The Black Prince and Enterprise, in Slocan City division, also shipped ore to Trail. Generally, mining is progressive in the Slocan, and prospects appear to be favorable for further improvement. An endeavor is being made to organize a company to acquire and operate the Galena Farm, near Silverton, Slocan lake, which since last autumn has been energetically and profitably worked by the estate of the late Patrick Clark, of Spokane, Washington. It is reported that a big shoot of ore has been opened in the Alpha property of the Standard Silver-Lead Mining Co.'s group, above Silverton, and important developments are expected.

**Nelson.**—Customs receipts at the port of Nelson during the month of August were $15,193, which total was about $2,296 higher than that for July. According to the statements of officials, the increase was due chiefly to the fact that much mining machinery, required for the equipment of mines in Kootenay district, was received during August. Further, it is claimed that mining equipment has been coming in to the district in increasing quantity ever since last spring.

### SILVER PRICES.

| September— | New York, cents. | London, pence. |
|---|---|---|
| 9th. | 68⅜ | 32 9/16 |
| 11. | 68 | 32⅜ |
| 12. | 67⅞ | 32 5/16 |
| 13. | 68 | 32⅜ |
| 14. | 68¼ | 32½ |
| 15. | 68 | 32⅜ |
| 18. | 68¾ | 32 11/16 |
| 19. | 68⅝ | 32⅝ |
| 21. | 68⅞ | 32¾ |
| 22. | 68⅞ | 32¾ |

# MARKETS

## TORONTO MARKETS.

Sept. 25—(Quotations from Canada Metal Co., Toronto)—
- Spelter, 12½ cents per lb.
- Lead, 9 cents per lb.
- Tin, 44 cents per lb.
- Antimony, 18 cents per lb.
- Copper, casting, 29 cents per lb.
- Electrolytic, 31 cents per lb.
- Ingot brass, yellow, 17½ cents; red, 20½ cents per lb.

Sept. 25—(Quotations from Elias Rogers Co., Toronto)—
- Coal, anthracite, $8.50 per ton.
- Coal, bituminous, $5.85 per ton.

## NEW YORK MARKETS.

Sept. 22, 1916—Connellsville Coke—
- Furnace, spot, $2.85 to $3.00.
- Furnace, contract, $2.75.
- Foundry, prompt, $3.25 to $3.50.
- Foundry, contract, $3.25 to $3.50.

Sept. 22, 1916—Straits Tin, f.o.b., 38.60 cents.
- Copper—
  - Prime Lake, nominal, 27.75 to 28.25 cents.
  - Electrolytic, nominal, 28.25 to 28.50 cents.
  - Casting, nominal, 26.12½ to 26.37½ cents.
- Lead, Trust price, 7.00 cents.
- Lead, outside, 6.97½ cents.
- Spelter, prompt western shipment, 9.17½ to 9.30 cents.
- Antimony—
  - Chinese and Japanese, 11.00 to 11.25 cents.
  - American, nominal.
- Aluminum, nominal—
  - No. 1 virgin, 98-99 p.c., 62.00 to 63.00 cents.
  - Pure, 98-99 remelt, 61.00 to 62.00 cents.
  - No. 12 alloy remelt, 48.00 to 49.00 cents.
  - Powdered aluminum, $1.00 to $1.15.
- Metallic magnesium, 99 p.c. plus, $4.00.
- Nickel, shot and ingot, 45.00 cents.
- Electrolytic, 50.00 cents.
- Cadmium, nominal, $1.45 to $1.50.
- Quicksilver, $73.00 to $74.00.
- Platinum, $85.00.
- Cobalt (metallic), $1.25.
- Silver (official), 68⅞ sents.

Metal Products—Following base prices represent the outside market except where otherwise specified and are entirely nominal except in the case of lead sheets and sheet zinc:
- Sheet Copper—
  - Hot rolled (f.o.b. mill), 37.50 cents.
  - Cold rolled (f.o.b. mill), 38.50 cents.
- Copper in rods, 42.00 cents.
- Copper in rolls, 39.00 cents.
- Copper wire (f.o.b. mill), 33.00 cents.
- Copper wire (f.o.b. mill), Oct., 32.25 cents.
- High Brass—
  - Sheets, 42.00 to 46.00 cents.
  - Wire and light rods, 45.00 to 48.00 cents.
- Heavy rods, 41.00 to 45.00 cents.
- Tubing—
  - Brazed brass, 45.00 to 50.00 cents.
  - Brazed brass (f.o.b. mill), 43.75 cents.
  - Seamless Copper, 46.00 to 48.00 cents.
  - Seamless brass (f.o.b. mill), 46.00 to 48.00 cents.
- Full lead sheets (f.o.b. mill), 8.50 cents.
- Cut lead sheets (f.o.b. mill), 8.75 cents.
- Sheet zinc (f.o.b. smelter), 15.00 cents.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Toronto.)

As of close Sept. 25th, 1916.

### New York Curb.

| | Bid. | Asked. |
|---|---|---|
| Atlantic Steel | 80.00 | 85.00 |
| Alta. Cons. | 31.00 | 34.00 |
| Butte | 7.38 | 7.63 |
| Can. Copper | 11.12 | 11.62 |
| Cambria Steel | 82.00 | 83.00 |
| Canada Cement | 64.00 | 67.00 |
| Con. Ariz. | 1.43 | 1.50 |
| Emma Copper | 1.93 | 2.00 |
| Howe Sound | 5.00 | 5.25 |
| International Petroleum | 10.62 | 11.00 |
| Inter. Nickel (New) | 51.87 | 52.00 |
| Kennecott Copper | 54.62 | 54.75 |
| Midvale Steel | 75.62 | 75.75 |
| Magma | 19.62 | 19.75 |
| Mother Lode | 38.00 | 39.00 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Davidson | .47 | .... |
| Apex | .08⅞ | .09 |
| Dome Consolidated | .10½ | .12 |
| Dome Extension | .35¼ | .35¾ |
| Dome Lake | .59 | .60 |
| Dome Mines | 24.75 | .... |
| Eldorado | .00⅜ | .00½ |
| Foley O'Brien | .75 | .... |
| Hollinger | 7.00 | 7.05 |
| Homestake | .61 | .... |
| Jupiter | .29½ | .30 |
| McIntyre | 1.47 | 1.48 |
| McIntyre Extension | .40 | .43 |
| Moneta | .17 | .18 |
| Plenaurium | .50 | .70 |
| Porcupine Crown | .... | .75 |
| Porcupine Imperial | .03½ | .03¾ |
| Porcupine Tisdale | .01½ | .02 |
| Porcupine Vipond | .36¾ | .38 |
| Preston East Dome | .04¾ | .05 |
| New Ray | .68 | .69 |
| Teck Hughes | .38 | .39½ |
| West Dome Con. | .38 | .39½ |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac | .25 | .32 |
| Bailey | .09 | .... |
| Beaver | .45¾ | .47 |
| Chambers Ferland | .20 | .21 |
| Calumet and Montana | .72 | .75 |
| Coniagas | .... | 5.00 |
| Crown Reserve | .58 | .59 |
| Foster | .... | .07½ |
| Gifford | .04½ | .05 |
| Gould | .... | .00⅜ |
| Great Northern | .05¾ | .06 |
| Hargreaves | .03 | .03½ |
| Hudson Bay | 65.00 | .... |
| Kerr Lake | 4.90 | 4.95 |
| La Rose | .61 | .65 |
| McKinley | .66 | .67 |
| Nipissing | 8.70 | 8.90 |
| Ophir | .10 | .10½ |
| Peterson Lake | 23¼ | .24 |

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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## Canadian Miner's Buying Directory.—(Continued from page 14.)

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**Zinc Spelter—**
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## ALPHABETICAL INDEX TO ADVERTISERS


**A**

Allan, Whyte & Co. ..... 2
American Zinc Lead & Smelting Co. ..... 5
Armstrong, Whitworth of Can., Ltd. ..... 10

**B**

Bath, Henry & Son ..... 13
Balback Smelting & Refining Co. 13
Beatty, Blackstock, Fasken, Cowan & Chadwick ..... 12
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd..... 4

**C**

Campbell & Deyell, Ltd. ..... 11
Canadian Copper Co..... 6
Canadian Explosives, Ltd..... 14
Can. Ingersoll-Rand Co., Ltd..... 1
Canadian Inspection & Testing Laboratories, Ltd. ..... 11
Canadian Laboratories, Ltd. ..... 11
Canada Metal Co. ..... 12
Cohen, S. W. ..... 11
Consolidated Mining & Smelting Co. ..... 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. ..... 13
Curtis's & Harvey ..... Outside Back Cover

**D**

Darling Bros. ..... 9
Dept. of Mines, Canada..... Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd..... 9
Dominion Engineering & Inspection Co. ..... 11
Dorr Co. ..... 11
Dwight & Lloyd Sintering Co., Inc. 7

**E**

Escher, Wyss & Co. ..... 4

**F**

Ferrier, W. F. ..... 11
Fleck, Alex. ..... 9
Forbes, D. L. H. ..... 11
Fuller, A. S. & Co. ..... 12

**H**

Hassan, A. A. ..... 11
Hendrick Mfg. Co. ..... 6
Hersey, Milton Co., Ltd. ..... 11
Heys, Thomas & Son ..... 11
Hitchcock, C. H. ..... 11

**I**

Imperial Bank of Canada ..... 6
Industrial & Technical Press.... ..... outside back cover
International Molybdenum Co.... 16
International Nickel Co. ..... 6

**J**

Jeffrey Mfg. Co. ..... 10
Johnson, Matthey & Co. ..... 11

**L**

Ledoux & Co. ..... 11
Lymans, Ltd. ..... 6

**M**

Murphy, Chas. J. ..... 11
Mussens, Ltd..... 10

**N**

Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

**O**

Ontario, Province of ..... ..... .....Inside Back Cover

**P**

Pacific Coast Pipe Co., Ltd. .... 9

**Q**

Quebec, Province of ..... 8

**R**

Roberts & Schaefer Co. ..... 3

**S**

School of Mining ..... 16
Segsworth, R. F. ..... 12
Standard Underground Cable Co. 9
Smith & Durkee Diamond Drill Co. ..... 12
Smith & Travers Diamond Drill Co. ..... 12
Smith, Sydney ..... 11
Spearman, Chas. ..... 11
Sullivan Machinery Co. ..... 2
Smart-Turner Machine Co. Ltd... 9

**T**

Tyrrell, J. B. ..... 11

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Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

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## GEOLOGICAL SURVEY

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Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

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Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

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Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Map 59A. Wheaton, Yukon Territory.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 160A. Manaimo Sheet, Vancouver Island.

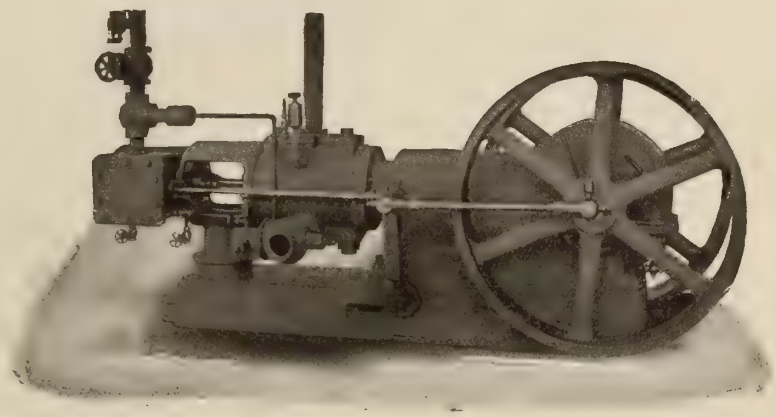
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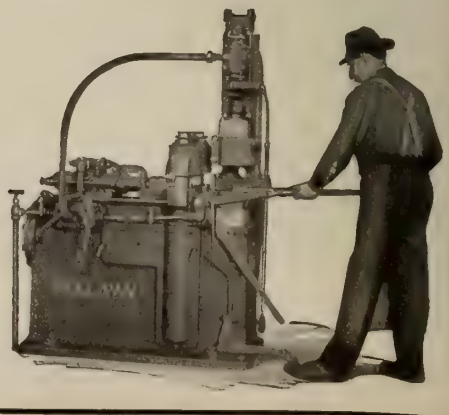
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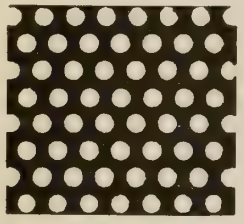
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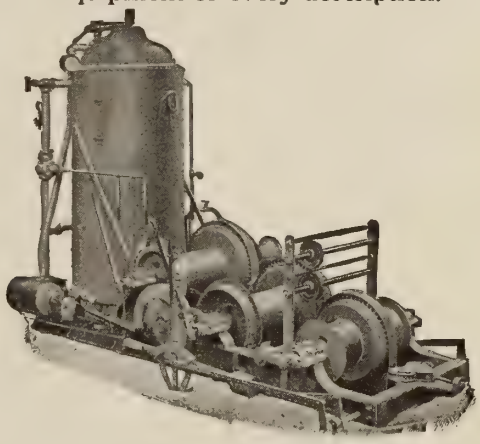
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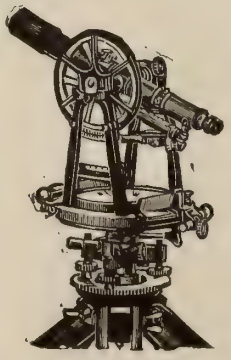
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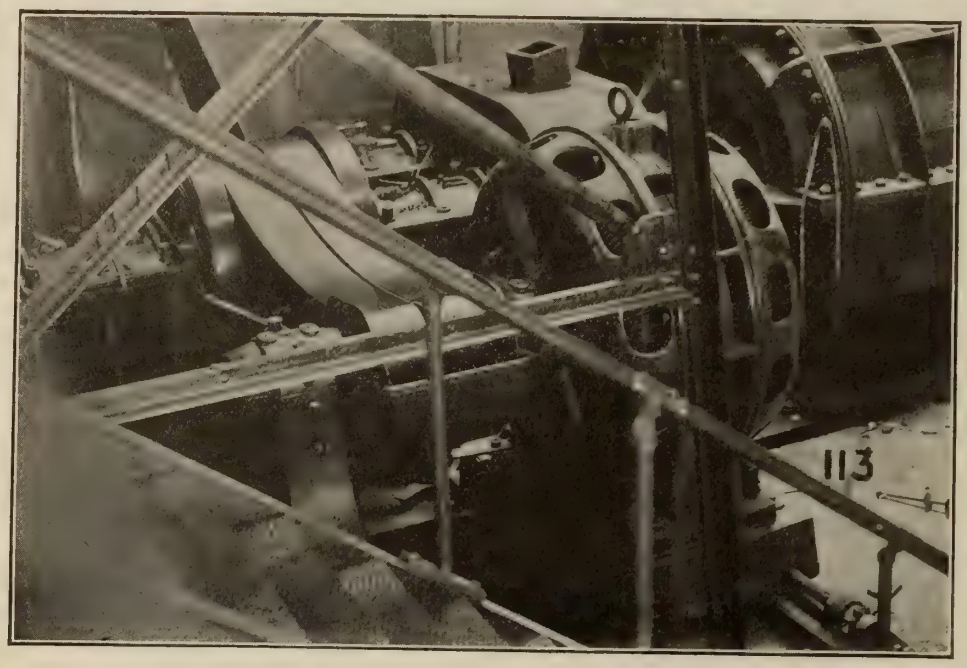


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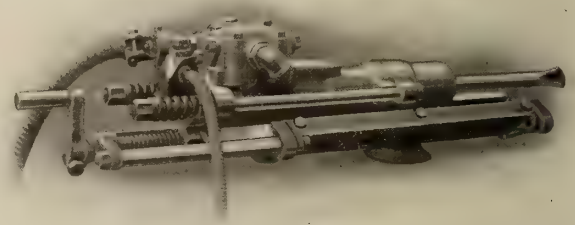
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, October 15, 1916. No. 20

## The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

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CONTENTS

| Editorial— | Page. |
|---|---|
| Coal and War | 479 |
| First Aid Work at Metal Mines in B. C. | 480 |
| A Feldspar Discovery. By A. G. Morrison | 481 |
| The Labor Dispute at Cobalt | 482 |
| Sudbury's Nickel Industry | 488 |
| Zinc Deposits of Montauban Township, Quebec. By J. A. Bancroft | 490 |
| Sulphur in Steel. By C. R. Hayward | 492 |
| The Brownian Movement. By Gilbert Rigg | 493 |
| The Occurrence of Nickel Ores | 494 |
| Proposed Department of Minerals and Metals | 497 |
| Personal and General | 498 |
| Special Correspondence | 499 |
| Markets. | 502 |

## COAL AND WAR

The normal production of the collieries of Nova Scotia is 7,000,000 tons per year. The production in the year 1913 reached 7,250,000 tons, but this was a peak-point in the curve of outputs. The figure of 7,000,000 tons is a conservative and fair representation of what the collieries of Nova Scotia should be putting out at this time. The actual production for 1916 will not greatly exceed 6,000,000 tons. Unless some improvement takes place—and it is difficult to see where the improvement is possible—the production of 1917 will decline to about 5,250,000 tons.

There seems to be no good reason to anticipate a cessation of hostilities before the autumn of 1917, and there are many well-posted observers who think that hostilities will extend into 1918. In any case, demobilization after peace is declared will be a slow and delicate process, and no person can foresee the condition of industry and trade, when that much-desired time shall finally arrive. Some eminent men see great prosperity immediately following the war. Others again see trade depression, labor troubles, and many unpleasant things. The truth is that no one knows, and one man's guess is as good as another man's. Nevertheless, it seems in every way probable that during 1917 no great number of men will return from the colors to the mines, and it is not only probable, but very likely, that more men will leave the collieries to join the colors.

The year 1916 has seen a great trade revival in Canada, and what almost amounts to a saturnalia of prosperity in the United States. Notwithstanding stock-market rumors and the speculations on the length of the war that vary the antics of the "war-brides," does anyone seriously see any diminution in the manufacture of war munitions in the near future? The daily wastage of millions of men on the almost continuously active front that encircles the Central Powers in itself calls for more and more supplies, and this takes no account of reserves and stocks, of reconstruction, and of new and extending markets.

Canada plays no mean part in the resources of the Empire to-day. She has become a financial factor of importance. If the recent Canadian War Loan had been for $250,000,000, instead of $100,000,000, it would have been easily raised. Our own little army of approaching 400,000 men requires supplies that bulk quite largely in the industries of a population of under eight millions, to say nothing of the far larger bodies of men that we must assist in munitioning.

If it has taken three months to get Thiepval and Combles, is it not fair to assume that we are still a long way from the bridgehead of the Rhine? There are other and unknown factors in this war that may upset all calculations on the resistance of the Central Empires, but has the German so far shown any signs that he will not fight a stubborn and indefinitely prolonged rearguard action as he withdraws to German soil? The most responsible and best-informed military opinion at the front has seen no deterioration in the German

morale, and no diminution in his ammunition supply. The power that can resist the Allied glacier in France, can hold the Russians at Kovel, and can simultaneously carry through a vigorous and on the whole successful offensive in the Dobrudja, while stubbornly resisting all along the Macedonian front, is a power still to be reckoned with.

Therefore it seems probable that the coming winter and all next summer will see the manufacture of munitions carried on with an intensity that even the present phenomenal rate has not yet approached. All this activity is based upon coal. Coal is the basic, indispensable, paramount munition of war.

If, then, while the sinews of the Empire are being strained to the utmost to munition our armies, and to provide adequate stocks against the "knock-out" which Mr. Lloyd George has foreshadowed, the Canadian coal production declines, as we have shown that it must decline, is there not a very grave mistake somewhere?

In the United States the bituminous coal production in the first half of 1916 increased over the first half of 1915 by thirty-five per cent. It is estimated that the production for the twelve months will reach the stupendous total of between 575,000,000 and 600,000,000 tons, which compares with the best previous annual production of 500,000,000 tons in 1913.

In Great Britain the Board of Trade has undertaken a house-to-house canvass asking for greater economy in the use of coal, pointing out that economy in coal consumption will have the following results:

(1) Increased power to help our Allies.

(2) Increased power to strangle German trade and injure the German economic position, by means of arrangements with neutral shipowners and neutral merchants, based on the supply of coal.

(3) An improvement in the foreign exchanges, and consequently a reduction in the cost of goods purchased abroad.

Are we so wealthy in Canada that we can afford to spend millions of dollars in the United States for coal that could and should be mined in Nova Scotia? Are we not also interested in this matter of exchanges?

The threat of a railway strike in the United States recently revealed that dependence of Ontario and Quebec on United States coal. If this calamity had occurred Nova Scotia could not have raised a finger to help, because the production of coal is already fallen far below the needs of the Maritime Provinces and the bunker business. It is no secret that war munitions of various kinds are being manufactured from the Atlantic Coast to Ontario. Is it wise to have all these industries dependent on the coal supplied us by a friendly, but nevertheless neutral neighbor?

What would the people of Canada say were the acreage of Canadian wheatfields reduced by fifty per cent.? Would there not be an immediate protest and strenuous endeavors to increase the acreage and the harvest yield? Yet it seems to be forgotten that without coal the wheat will stay in the West, and will never reach the hungry mouths across the seas. Without coal we could not have sent one man to France, nor shipped a pound of steel or a pint of toluene. The idea of a declining production of bituminous coal at the present time would be farcical in its utter ineptitude were not the reality so grave, and actually with us.

## FIRST AID WORK AT METAL MINES.

The experience in connection with efforts made to arouse general interest among metal miners in British Columbia in matters relating to instruction in first aid to the injured has not been as favorable thus far as could be desired. Nevertheless the officials directly charged with the duty of encouraging men engaged in and about metalliferous mines in the Province to attend classes for instruction and to become competent to render first aid in cases of emergency are stedfastly persisting in this important and beneficent work, looking forward with confidence to increasingly good results as time passes and more of those who should be chiefly concerned come to a realization of the necessity rather than the mere desirability of their taking upon themselves personally this duty to their fellow-workers as well as to themselves. Only recently was the report of the British Columbia Department of Mines for the calendar year 1915 published, which accounts for this apparently tardy reference to the information given by the Department's instructor in first aid, Dudley Michell, of Victoria, of the results of his work during the year.

As Mr. Michell's report for 1915 covers only his second year's official work in giving attention to first aid and the use of mine rescue apparatus, it may be of interest to first recall what he accomplished in 1914, and then briefly review what was done in 1915. It should be premised, though, that Mr. Michell is not generally called upon to instruct those who attend classes in first aid, that duty falling to duly qualified surgeons, the policy of the Department of Mines being to encourage men to endeavor to obtain first aid certificates of competency from a recognized Ambulance Association, which can only be secured by passing the examination under the auspices of such an association after the prescribed number of lectures, given by an approved surgeon instructor, shall have been attended, and the requisite percentage of marks have been earned at an examination held by an authorized surgeon examiner.

Mr. Michell entered upon his duties in May, 1914, and about the end of that month he met several mine managers at a meeting of the Western Branch of the Canadian Mining Institute at Nelson, West Kootenay, and placed before them the proposed policy of the Department of Mines with the object of inducing miners to take first aid instruction. Directly afterward he set about organizing St. John Ambulance Association "centres," and forming first aid classes. The immediate result was that two classes were formed at Rossland, followed by three in Boundary district, and afterward by five in various parts of West Kootenay. Then the European war was commenced, and, as a result of the consequent demoralization of the markets for metals, many of the metalliferous mines were closed for the time, and most of those who had been employed at them scattered far and wide. Rossland mines, only, escaped the general disorganization, so that the first aid work commenced in that camp was continued without interruption, until to-day it is established with little likelihood of the larger mines in the camp ever again being content to go along without having among the mine employees a considerable number of men trained in first aid or mine rescue work, or both.

In the cases of the mines employing comparatively large numbers of men and having the services of a resident surgeon available for purposes of instruction,

there was, in important instances, not much difficulty, but as Mr. Michell reported, "it has been proven that in the small mines situated long distances from town successful results are not obtained by an instructor, owing in most part to the large proportion of men employed at these mines being unable to properly speak and understand English, while the remaining men do not seem to care to have their leisure hours taken up by instruction in first aid, especially in the only place they have for recreation—the bunk-house—where they wish to read, write, etc."

It is noteworthy that during Mr. Michell's first year of office 405 men attended first aid instruction classes in Kootenay and Boundary districts, and 76 in the Coast district, together 481. These figures relate only to metalliferous mines. For 1915 Mr. Michell's report included the following:

"More than 700 miners attended first aid lectures at the various mines of the Province. The net results show that 301 men (from coal mines 242 and from metal mines 59) passed a final examination in first aid work and were awarded various grades of certificates by the St. John Ambulance Association. The actual number of men finishing this course may be placed at 450. The difference between the total number of men attending the lectures and the number passing final examinations is due to various causes, some of which are: Failure to pass examinations, class completing lectures but not examined, class disbanded, and lack of interest; all of which causes have unfavorably affected results. I regret to say that the results obtained from the metal mines are not as good as were to be expected."

Classes were conducted in coal mining districts of Crowsnest in Southeast Kootenay, Nicola valley, and Vancouver island, and in metal mining camps at Kimberley, East Kootenay; Rossland, West Kootenay; Greenwood, Boundary; and Van Anda, Texada island.

Mr. Michell reported, further: "The largest number of men trained in first aid in one year and at one company's mines was at the mines of the Crow's Nest Pass Coal Co., where 139 men passed first aid examinations. This number shows approximately one trained man for every fourteen persons employed above and below ground at those mines, which result is highly satisfactory for one year's undertaking. All the classes were taught and examined by duly qualified medical practitioners, and were conducted in accordance with the prescribed rules of the St. John Ambulance Association.

"At the Le Roi gold-copper mine, Rossland, a very systematic method of training was adopted. The afternoon shift was divided into three sections; each section reported at the mine once a week, an hour before the shift commenced, and received practical instruction, by a trained first aid man, in the work of bandaging, etc. There has also been established at this mine a safety department, a safety committee, and a safety engineer; their duties are the systematic inspection of the mine and the headworks with regard to safety, encouragement of first aid instruction, and 'safety first' teachings in general."

It may be added that this year interest in first aid work is being well maintained at the Consolidated Mining and Smelting Co.'s Centre Star and Le Roi mines, Rossland; attention is being given to it at the Britannia Mining and Smelting Co.'s copper mines in Vancouver mining division, Coast district; and a Mine Safety committee has been organized and is doing good work, including arranging for giving instruction in first aid, at the Granby Consolidated Co.'s Hidden Creek copper mines near Observatory inlet, also in the Coast district.

## A NEW FELDSPAR DISCOVERY

By A. G. Morrison.

An interesting find has recently been made six miles north of Webbwood, on the Sault Ste. Marie branch of the Canadian Pacific Railway, in Northern Ontario, on S. W. part of S. part Lot 3, Con. 5, S.E.-40 Ac. Lot 4, Con. 5, and N.E. ¼ of N ½ Lot 4, Con. 4, Township of Shakespeare, on the south bank of the Spanish River, an enormous deposit of orthoclase feldspar has been found.

The dyke of feldspar has been traced for a distance of 1,400 feet. It has a minimum width of 25 ft., and at many places is several times this width. It runs in a general direction from northeast to southwest, and is situated at a contact between greenstone schist (probably Keewatin) and granite or gneiss (probably Laurentian). The identification of the country rock is due to Doctor Smith of the Nicholls Smelting and Chemical Company.

The find is an extremely interesting one from a geological point of view, as numerous orthoclase crystals can be found. One or more crystals were observed that were a foot or more in diameter. At one point the greenish tint of microcline was observed, at another point the dyke was composed of pure quartz, but this was a comparatively small area.

Considerable difficulty was at first experienced in finding true orthoclase crystals with the required 60 and 89 degree angles and true cleavage faces, but after searching they were found in abundance. The rock on each side of the dyke is very much schisted.

A road from Webbwood leads to within half a mile of this interesting find. It is in good condition with the exception of the last half mile. The Spanish River runs through the property, but can hardly be said to be navigable, owing to the numerous shoals.

### CUBAN POTASH.

Boston, October 3.—Experts for one of the leading American fertilizer companies have just completed a short examination of the Cuban potash discovery, have collected samples and are on their way back to the United States. By cable these experts state that they are not particularly impressed by what they find, and that the degree of solubility in the potash-bearing ore is very low.

Judging by the brief data obtainable thus far and at this distance, good judges incline to the opinion that this Cuban ore is either felspar or some mineral of this same family group. That potash salts should outcrop is almost unbelievable, because potash salts are extremely soluble in water. Unless the Cuban potash discovery is potash salts it will have little importance, in the opinion of large potash users in this country. The Cuban cables speak of this potash as soluble in acid. This is not the desideratum. What is wanted is potash salts soluble in water. Until this is found, no serious competitor of German potash will have been created.

# THE LABOR DISPUTE AT COBALT

The majority and minority reports of the Commission which recently investigated labor conditions at Cobalt are as follows:

## FINDING OF MAJORITY

To the Hon. T. W. Crothers, K.C., M.P., Minister of Labor, Ottawa:

Report of Royal Commission consisting of Emerson Coatsworth, Junior Judge of the County Court of the County of York, in the Province of Ontario; Edward Thomas Corkill, of Copper Cliff, in the said Province, Esquire, Safety Officer of the Canadian Copper Co., and Joseph Gibbons, Esquire, of the said City of Toronto, Business Agent for the Amalgamated Street and Electric Railway Employees of America; appointed to investigate the unrest in the mining industry at Cobalt, in the Province of Ontario; and the nature and causes thereof, the appointment of the said Commissioners being dated the 28th day of August, A. D. 1916.

Your Commissioners immediately upon their appointment arranged to meet in the Town Hall at Cobalt, Ontario, at 2 o'clock p.m. on the 31st day of August, 1916, and held 15 sittings in the Town of Cobalt, and one sitting in the Town of Haileybury. Generally speaking the meetings were held at 10 a.m. and 2 p.m., but on one occasion, in order to accommodate some of the witnesses, an evening sitting was held. At the first meeting, held as above stated on the 31st day of August, Messrs. Davidson, Joyce and Gorman appeared as representatives for the employees of the mines. No person appearing on behalf of the employers, to represent them, your Commissioners ordered that a notice be sent to each of the mine managers, between 35 and 40 in number, notifying them of the dates and hours of meetings, and inviting them to attend and hear the case presented on behalf of the men, and to give such evidence as they thought fit in reply, and a further notice to all persons concerned was inserted by advertisement in "The Cobalt Daily Nugget" on the 2nd, 5th, 6th and 7th days of September, notifying any person interested to attend the meetings and give evidence, or take such other part as they might see fit. No person, however, appeared for or on behalf of the employers or Mine Owners' Association until the 7th September, when Mr. Bateman, the general manager of the La Rose mine, appeared and gave his evidence, and on the following day, by appointment, a number of the mine managers came forward and testified for your Commissioners, giving their statements as to the right of the employees to have their demands recognized.

There were in all 79 witnesses produced and examined on behalf of the employees and eight witnesses produced and examined on behalf of the mine owners and managers in reply.

With regard to the grievances of the men, they were limited to two; one, a demand for increased wages; two, a demand that the employers recognize and confer with a committee appointed by the men.

Your Commissioners are very pleased to be able to report that so far as all other conditions of working the mine are concerned, the miners were united in expressing their satisfaction, and except for the two matters above specified, no complaints whatever were made, though one or two matters of small importance were brought forward by individuals, not affecting the miners generally.

As to the two matters brought forward on behalf of the miners, it is desirable to deal with them separately, giving the report of the investigation, together with the evidence taken before the Commissioners, and their opinion thereon.

### Claim for Increased Wages.

The matter of increased wages was urged very strongly by all the witnesses brought before your Commissioners on behalf of the employees, and just as strongly resisted by the mine managers. The agitation for increased wages began in the early part of the present year, 1916, and was based, as the employees claim, on the increased cost of living. The agitation began probably in March or April, 1916. The Local Union, called the Cobalt Miners' Union, No. 146, took the matter up, and held several meetings. On the 1st day of May, 1916, the managers anticipated any action by granting an increase of 25 cents a day to all underground workers, and also some of the surface workers, representing in all probably three-quarters of the total employees, who would number in the neighborhood of 2,800 men, and also giving a bonus of another 25 cents a day to all the employees when the price of silver should be 70 cents or upwards per ounce. The complaint of the men with regard to this was that the direct increase of 25 cents a day should be extended to the whole of the employees, because the lower paid men were the most needy, and it was they who did not receive the increase, and also so far as the bonus was concerned, that the price of silver, on which it was based, was so high, that they have only since received the bonus for one or two months, and, consequently, it has proved of trifling advantage to them.

Very much evidence was brought forward by and on behalf of the men to prove the increased cost of living, particularly within the last two or three years, some complaining that the increase was as high as 30 per cent. or 40 per cent., and others running from 20 per cent. to 30 per cent. The employers, in their answer to this part of the claim of the employees, admitted the increase in the cost of living, but claimed that from figures gathered by them from the reports of the Labor Department, the increased cost of living for the last two or three years was only about 10 per cent., and this was adequately met by the increase made in wages and the bonus above mentioned. It will therefore be seen that the fact of the increased cost of living was not in dispute between the employers and the employees, but only the percentage of increase, and your Commissioners are bound to say that the evidence adduced on both sides was very strong on behalf of the employees to show the increase up to 30 per cent. and of the employers keeping it down to about 10 per cent., and it is somewhat difficult in view of the conflicting evidence, to determine exactly what the percentage of the increased cost of living may be. The mine managers also claimed that the conditions under which they are operating, and the prospects for the future are such as did not justify them in granting any further increase in wages.

Your Commissioners, upon reviewing the whole of the evidence and the statements made to them, and weighing the same carefully, and having in mind all the conditions bearing upon the claim for increased wages, have concluded that they are not prepared at the present time to recommend an increase in the rate of wages, but they confirm what the mine managers

have already done, including the bonus to the employees, but in their opinion the bonus should be based on silver at 65 cents an ounce instead of silver at 70 cents an ounce, as this will more fully meet what the mine managers intended in the way of advantage to the employees.

**Recognition of Committee.**

The other grievance laid before your Commissioners was that the mine managers refused to pay any attention to or hold a conference with the Committee appointed for the purpose of interviewing them in regard to the matter of wages. The recent history of this matter is as follows: In the month of April the Local Union of Miners, which then consisted of between 400 and 500 miners and has gone up since the agitation to about 1,500 members, held several meetings to consider the question of the rate of wages and to take some steps to have them increased, and after holding two or three meetings on or about the 14th May, they called an open meeting in the Grand Theatre for all mine employees for the purpose of discussing the matter and at this meeting there were present between 700 and 800 miners and other employees of the mines, and the matter of the demand for increased wages was fully and freely discussed, and a Committee appointed to meet with and interview the mine managers, or the Mine Managers' Association, with a view to bringing about some satisfactory arrangement with regard to wages, and at this meeting the following were appointed as the Committee: Joseph Gorman, secretary of the Local Union, chairman; Wesley Morrison, carpenter; Patrick Redmond, assistant secretary Local Union; J. M. Gillis, pipe fitter; Lyman McFadden, blacksmith's helper, and Jas. Wilson, mill worker. A few days after the appointment of this Committee, the following notification was sent to Mr. Robert Livermore, the president of the Mine Managers' Association; and also to each of the mine managers:

Cobalt Miners' Union No. 146 of the Western Federation of Miners.

Cobalt, May 22nd, 1916.

Mr. Robert Livermore,
Manager, Kerr Lake Mining Co., Cobalt.

Dear Sir,—On behalf of the members of Cobalt Miners' Union No. 146, W.F.M., we are writing you to request a conference at the earliest convenience, between the Mine Managers' Association and a committee of the Miners' Union, to discuss and if possible to arrange an increase of wages for underground and surface men in this camp. We are writing you as President, and Mr. Thompson as Secretary of the Mine Managers' Association. Hoping for an early reply, we are, Yours truly,

(Sgd.) JOSEPH GORMAN,
Cobalt Miners' Union, No. 146, W.F.M.

Generally speaking there was no answer made by any of the 35 or 40 mine managers, but two replies were received, stating that the managers declined to have anything whatever to do with the Union. The matter remained in this position until your Commissioners were appointed. When the employers came before your Commissioners and were asked why they objected to a conference with the above committee, they stated their reason to be that they regarded this committee as a committee of the Western Federation of Miners, and that they objected to having anything to do with that Federation. They stated distinctly and positively that they had no objection whatever to meeting with their own men, and that in their judgment it was a perfectly proper thing for the miners and mine workers to organize, and their sole objection to meeting was as above stated, that they considered such a meeting would be a recognition of the Western Federation of Miners, and this they desired to avoid. It should be pointed out that there was at this juncture, evidently some misunderstanding, because the Committee above mentioned consisted of local miners and mine workers, and was apparently just such a committee as the mine managers were prepared to meet, and there was evidently misunderstanding of the nature and scope of this Committee.

Your Commissioners are therefore of the opinion, that in view of the fact that the Committee in question consists entirely of local men, miners and mine workers, it would have been in the interest of all parties concerned to have conferred with the men as to the possibility of making any change in the rate of wages.

All of which is respectfully submitted.

(Sgd.) E. COATSWORTH, Chairman.
(Sgd.) E. T. CORKILL.

Toronto, 12th September, 1916.

## MINORITY REPORT

To the Hon. Thomas W. Crothers,
Minister of Labor, Ottawa, Ont.

I herewith submit to you my report as a member of the Royal Commission appointed to investigate the grievances of the Mines in Cobalt district. I differ materially with my colleagues as you will perceive, and submit a minority report.

I am in accord with the report made by the majority of the Commissioners, His Hon. Judge Coatsworth, and E. T. Corkell, Esq., as far as page 3, and ending with the words: "Their opinion thereon." I am not in accord with their findings as expressed under the caption, claims for increased wages. I submit in place thereof the following:

The employees, both underground and surface, should have received an increase of 50 cents per day, owing to the large increase that has taken place in the cost of living since their present rate of wages was established, and the fact that the large increase in the price of silver would have enabled the mine owners to have paid the increase and still have a larger profit than at former prices.

The employees claim that the cost of living has increased 30 to 40 per cent. since their present standard of wages was fixed, and in support of their claim presented a cost of living for family of five, and in support of their claim brought forward a number of the leading merchants of Cobalt, who submitted invoices in some cases as far back as 1908 (the time that the present rate of wages was established). A few comparisons might be interesting to the public:

Beef—1914, $11 per hundred, now $17 per hundred; pork—1914, $12 per hundred, now $18. Canned and cured meats increased in proportion. Cheese—1914, 14½c. per lb., now 21c. Butter—28c., now 38c. Lard—13c., now 18c. Sugar—1914, $4.50 per hundred, now $7.85. Flour—1913, $2.82, now $4.20. Beans—$1.95 per bushel, now $5. Potatoes—$1, now $2.25. Invoices were also submitted showing that furniture, carpets, oilcloths, etc., had increased 25 per cent.; boots and shoes 25, and woolens 40 per cent.

The mine managers admitted an increase, but contended the increase was only 10 per cent., citing figures from the Labor Gazette as their authority, and

claimed that the 25 cents per day granted covered this increase.

I desire to point out here that the 25 cents per day increase was not given to the surface men, who are the low paid men, and consequently the most in need of the increase, as it takes as much to maintain the family of the man who works overground as it does to maintain the family of the man who works underground, and overground men are just as necessary for the carrying on of the work as the underground men.

The fact that the mine owners paid a bonus of 25 cents per day to all men in addition to the 25 cents per day, making an increase of 50 cents for underground employees, demonstrates the fact that the 50 cents per day increase was a just request. The bonus was paid when silver was 70 cents per ounce or over. The men only received the bonus for one month when silver went below the 70 mark. The majority report recommends that the bonus be paid when silver is 65 cents or over. I contend that the wages of the employee necessary for his maintenance should not be dependent upon the fluctuating price of any product, especially when that product has no bearing on the cost of living.

(Sgd.) JOSEPH GIBBONS.

## MINE MANAGERS' EVIDENCE.

Several mine managers submitted evidence to the Commission. Following are extracts:

### R. B. Watson.

Mr. R. B. Watson, general manager of Nipissing Mines, said in part: I submit a table showing the Cobalt wage scale compared with the wages paid for the same class of work at four mines in Porcupine, two in Sudbury, three in Quebec and two in Nova Scotia. From this it will be seen that the Cobalt scale is higher in every case than the average of these eleven mines; it is practically the same as the Porcupine scale; is higher than the average paid in Sudbury and very much higher than the wages paid in Quebec or Nova Scotia. The Cobalt scale is as follows:

Underground workers—Machine runners, $3.50; machine helpers, $3; muckers, $2.75.

Surface workers—Carpenters, $3.50; carpenter helpers, $2.50 to $2.75; teamsters, $2.75; teamster helpers, $2.50; common laborers, $2.50 to $2.75.

When Cobalt started, the wage scale was much higher than in other mining camps in Ontario, Quebec or Nova Scotia. It was a new country; the cost of supplies was high; they were boom times. Sudbury was paying $2.75 for miners; the Cobalt scale was $3.25.

While Sudbury has since raised wages several times, it is now only equal to the Cobalt scale.

Hours of labor have decreased from 10 to 9 and then to 8 hours for the same wage.

This is an abnormal time; it would be unfair to take for granted that these conditions will continue; if wages were increased now it would be difficult to lower them when conditions become normal again.

The production of Cobalt has been getting less every year since 1911; some of the mines are worked out; the rest are working leaner ores and trying to lower the working costs in every direction.

When silver dropped to 46 cents in 1914, there was no reduction of wages; for a time there was no market for silver, but the mines continued work.

In May the mines voluntarily agreed to raise all underground men 25 cents per day; to raise such surface men as the individual manager thought advisable and to give a bonus of 25 cents to all in addition to the above in case silver averaged 70 cents for the month. This bonus was paid by most companies for two months although it was only earned for one.

Before the May change, the surface men on the Nipissing were getting an average wage almost exactly the same as the average wage paid to the underground men. There were two main reasons why the underground men got a flat raise all around while the surface men were raised or not at the discretion of the manager. The first reason was that owing to the high price of metals there was great activity in the mining camps of the United States and Canada; this made a scarcity of miners, and it was necessary to increase our schedule in order to keep the miners from going elsewhere. The other main reason was that it has always been the custom to pay the underground men more than is paid the surface man for doing the same class of work. Thus, a common laborer gets $2.50 on the surface, while the mucker, who does the common labor underground, gets $2.75. The 25-cent raise gave him this advantage. The miner's occupation is skilled work, and because of this skill he honestly came by his increase in wages, through force of circumstances. There was no similar reason why all the surface men should get a flat raise. The mechanics are already well paid; they work the year around at less hazardous occupations than the miners. The balance of the men on the surface are mostly unskilled; while there are a few mill men holding jobs requiring a certain amount of skill and proficiency, the greatest majority of men working in the mills have never had any previous experience in this work.

The Custom mills working on a per ton basis and those low grade properties wavering between a profit and a loss, objected strongly to a flat raise on all surface men, on the ground that they could not afford it. It was, therefore, thought better that each individual manager should determine what surface men should have increases.

The war has taken a large proportion of the young and vigorous among the unmarried men; this has created a shortage of labor, and it has been necessary to fill their places with unskilled men; drill runners' helpers are now drill runners, and laborers have been made helpers on drills; the result is that the efficiency of the total force is much lower than two years ago. While the wages of some classes have not been increased, many of the men have been promoted from an inferior job to one commanding more pay.

Complaint has been made before this commission as to high ground rents charged, and to the possibility that the tenant may be given notice to move. The rent paid on the regular-sized lot on the Nipissing, LaRose, and Chambers Ferland varies from $1.35 to $4 per month. The average on all the 390 lots outside of Lang street—the business section—is $2.70 per month. The clause that a tenant must move on 30 days' notice is necessary, as his house may be located directly on top of a vein, or the ground may be absolutely necessary for mining purposes. It has not been necessary to give such notice to more than half-a-dozen tenants in the last half-dozen years.

In July, 1916, the savings account in all the banks in Canada amounted to 789 million, or about $100 per capita. In Cobalt the total of the savings account is estimated by bank managers at $1,500,000. This is about $250 per capita. This estimate of total in savings account does not include deposits by mining companies, but is the actual savings of individuals of the camp. One bank alone has 1,200 savings accounts, allowing

only 1,200 more for the other three banks together; it appears that two out of every three men has a bank account.

**B. Neilly.**

Mr. B. Neilly, superintendent Penn-Canadian Mining Co., said in part: Until two weeks or so ago we maintained a boarding camp and lodging-house at a cost to the men of 70 cents per day, although the actual cost to the company was about 83 cents per day. Immediately following the outbreak of war, there was a surplus of labor, and I advised our surface and underground superintendents to engage in future, as far as possible, only married men and those with dependents. In this way the number boarding on the property gradually decreased from about 80 to about 26. Finding it impossible to decrease the cost of labor in the cook camp proportionately, a raise to 75 cents per day was posted. However, prior to the raise taking effect, and for the first time in two years, complaints were made concerning the preparation of the food and the statements of the men that superior board could be obtained in town at a more satisfactory price, we reluctantly decided to close down the boarding-house.

If, as is claimed, there is a feeling of unrest in the camp, and emphasizing the fact that there is no man in our employ, as far as I know, dissatisfied with his job, I submit that that feeling of unrest has been engineered by those other than the men actively engaged in mining here. The statement has been made often just lately that a man is entitled to all the money he can get, even if forced by strike measures. If this were a true condition, then the companies on the same basis would be justified in obtaining labor at the lowest possible rate. No reasonable man can subscribe to the above statements, and that this company and the others in camp have proven their good faith with the men during the fall of 1914 and the year 1915, when in face of the greatest difficulties they made no move or expressed no desire to decrease the scale of wages prevailing prior to the outbreak of war. 1914 conditions may be repeated after the war.

When the war was declared, our company, with no free balance in our treasury, and with no quotation for silver, being unable to arrive at a settlement with the smelters, called a board meeting to discuss the advisability of continuing operations. General opinion tended to the feeling that silver quotations would not recover until after the war, and general conditions were most perplexing. On the request of the board for advice, I described local conditions and urged that while from a strictly business standpoint we were taking grave chances, that we were morally bound to continue operations if in any way possible. To make a long story short, one director asked the question: "What will the men do if we close down?" I said, "I do not know." Then said he: "We will borrow the necessary money and continue for the present at least."

Since the war broke out our physically fit, our bravest and best, have gone to the front, and while we have still a large proportion of splendid miners, nevertheless the absence of the enlisted men has made itself felt and efficiency underground has dropped accordingly. We are not getting the work done to-day that we were getting a year ago.

Finally, I assert that there is still a feeling of mutual confidence between our men and the company. If later on the men of Cobalt should insist upon higher scale of wages than at present in force, this company will be forced to suspend operations. The whole question before us now is one of ordinary business. When the price asked and offered cannot be made mutually satisfactory the deal is dropped, and there is no reason for ill-feeling on this account, the parties interested having agreed to disagree.

**E. Steindler.**

Mr. E. Steindler, manager Dominion Reduction Co., said in part:

In none of the custom mills have the managers been approached by their men with respect to an increase in wages, or with any other complaints. All of the managers are willing at any time to meet their men, either individually or collectively, to head grievances of any nature.

One of the main arguments urged for an increase in wages centres around the advance in the price of silver. The customs mills do not participate in any profits derived from variations in the price of silver. On the contrary, the increased cost of materials has affected the profits of the mills. The ore treated by the mills is treated at prices contracted before the war, and no increase in tariff is possible.

Below will be found a partial list of the more important commodities, showing the cost before the war and the present minimum cost:

| Material. | Cost prior to war. | Present cost. |
|---|---|---|
| Cyanide, per lb. | .15 | .21 |
| Al. dust, per lb. | .34 | .90 |
| Lead acetate, per lb. | .08½ | .11¼ |
| Shoes and dies, per lb. | .05 | .06 |
| Mercury, per flask | 37.50 | 80.00 |

The wages paid in the mills in the camp have been steadily advancing since 1907. At that time common labor was paid $1.75 per day of 10 hours. At the present time $2.70 is the prevailing rate, with a minimum of $2.50, all on a nine-hour basis.

It is a fact, established by the experience of all the managers of the camp, that labor to-day is less efficient than formerly. Less work is obtained from the men getting 30 cents per hour now than was obtained from the men paid $1.75 for a ten-hour day, or 17½ cents per hour.

It is the honest conviction of the mill managers that the present wage scale is adequate, fair and all that the character of the work is worth. The managers are confident that their men are satisfied with wages and other conditions; that no spirit of unrest exists except that agitated by a radical minority of the Western Federation of Miners.

**H. Park.**

Mr. H. Park, superintendent Nipissing mines, said in part:

I wish to present a statement containing various tables and information bearing directly on the cost of food in Cobalt and in several other localities in the Dominion. All of my figures are taken from Dominion reports as published monthly in the Labor Gazette, the official magazine of the Department of Labor at Ottawa. The statements made in the Gazette are obtained from reliable reports from sixty representative cities of the Dominion, situated so as to cover as completely as possible all parts of the Dominion. So far as it is possible to make them, these reports are accurate, and there can be no argument or doubt cast on the figures I will present. They are cold, accurate facts, and can be verified by anyone who wishes to take the trouble and time to do so.

My statements cover the years 1913, 1914 and 1915. No statistics were kept by the Department on the cost of foods in Cobalt prior to January, 1913. The Gazette

publishes monthly two tables dealing with prices of foodstuffs in the Dominion. One table shows the prices in each one of the sixty cities of thirty-one articles which are termed "Staple Foods." The second table is called the "Family Budget," and shows the price of twenty-nine varieties of food necessary to support a family of five. From these tables, direct and positive facts can be obtained as to the actual cost of living in Cobalt since January, 1913.

In the following table I give actual costs of "family budgets" in Cobalt, the Dominion, and the Provinces of Ontario and Nova Scotia. Nova Scotia is given for the reason that it is the only other province in Eastern Canada that compares with Ontario in the production of mine products.

| | 1913 | 1914 | 1915 |
|---|---|---|---|
| Cobalt | $7.56 | $8.10 | $8.08 |
| Dominion | 7.34 | 7.73 | 7.87 |
| Ontario | 7.20 | 7.48 | 7.68 |
| Nova Scotia | 7.29 | 7.48 | 7.83 |

The outstanding fact of actual conditions is that the cost of food in Cobalt has increased in three years only seven per cent. Equally outstanding is the fact that the cost of food in Cobalt was the same in 1915 as it was in 1914. These figures are actual facts, and any wild and unsupported statments that food has gone up 50 per cent., or any other amount different than that shown in this table, are made without any knowledge of actual cold facts.

The figure that counts and is of value is that which shows the average result. The method of finding that out is the same method that applies to all manner of business or estimates of any kind. It is not a question of what happens to-day or to-morrow or next week. It is the "law of average" that counts. The Department of Labor gets this average by proper application of proper and innumerable details, announces the average, and that figure is accepted by governments the world over. The impossibility of attempting a comparison between the Department's average results and a few individual invoices covering no period, is obvious.

**S. W. Cohen.**

Mr. S. W. Cohen, general manager Crown Reserve, said in part:

We do not feel that a serious situation or that considerable unrest exists in the mining industry of Cobalt. We feel there is nothing whatever to warrant the investigation by Royal Commission, although now that the Royal Commission has been appointed, we freely welcome them to Cobalt and to the strictest investigation that they can possibly make.

We do not feel that the majority of the employees are in any way dissatisfied with either working conditions or their salaries. We realize, of course, that any employee would like a raise in pay, but we consider this fact is a universal one, and cannot be considered as specially affecting the situation in Cobalt. We know that the rate of payment is as great as that of any other mining camp in Eastern Canada, and much greater than most.

We know that the working conditions are good. There are no poisonous gases. No extreme heat. No very dusty places. No miners' consumption. In fact, living conditions in the camp and working conditions underground are as good as the industry affords.

The Cobalt mines are not dangerous to workers. Provincial laws and inspection provide protection and safety for the employees, with which the mine managers of the district heartily co-operate.

We feel that the whole situation is due to a small radical minority, who for selfish or ambitious reasons, have tried to make it appear that a serious difference exists between the managers and the employees, when no such difference does actually exist, and that these men have taken advantage of the scarcity of labor, due to the fact that a great many of our finest employees have taken up arms for their country and have gone overseas to fight for the flag.

Between the managers and employees there has always been a general feeling of respect and good-will, and we are at all times open to arbitration between ourselves and our employees, but we wish it to be absolutely understood that we will not submit to the dictation of a few men who do not actually represent our employees, and who have only their own selfish ambitions at stake. They neither go to war to fight for their country nor try to keep the industries of the nation going at home, but at this critical period attempt to stab it in the back by stirring up strife and turmoil, when all classes should unite for the main welfare of the Empire.

When the war started, two years ago, very uncertain conditions existed in the silver mining industry. The price of silver dropped very materially at once, and for several weeks there was no market whatever. The Privy Council of the Dominion Government recognized the seriousness of the situation and offered to advance the mines of Cobalt certain moneys against bullion shipments. In spite of these facts, that the companies did not know what the outcome would be, they all responded as loyally as possible to the conditions and most of the mines were kept going. At that time labor in Cobalt was a drug on the market, but the wages were in no way effected and everything possible was done by the companies to provide work for their employees.

On May 1st, last, a voluntary increase of 25 cents per day was given all underground employees, and a large number of surface employees, and, in addition, a further 25 cents per day was promised, and later given to all employees, surface, mill and underground, when the price of silver was 70 cents per ounce for an average of any month. To-day, the minimum wage of practically the whole camp is $2.50 per day, and this for common surface labor.

When the eight-hour day went into effect, and the working time of underground employees was reduced from nine to eight hours, the pay was not reduced.

The Township of Coleman has a good revenue under the Supplementary Revenue Act, which is a tax directly on the mines, so that schooling for the families of the employees is provided without any cost to them.

The employees pay 50 cents per month for hospital and 50 cents per month for doctor. When this amount was found to be insufficient to run the hospital, the mines contributed the moneys, amounting to practically $30,000 to put the hospital on its feet. In fact, the whole attitude of the mine managers (and I feel absolutely certain the majority of the employees in the camp will bear me out in this statement) has always been sympathy, goodwill and fraternity.

I myself have been a miner. Most of the mine managers in the camp have worked underground, and I assure you, under much worse and much more trying conditions than exist in Cobalt. We understand absolutely what the miner is up against, and we have honestly tried to do for them whatever was in our power.

As far as the special mine of which I am general manager is concerned (the Crown Reserve), from the year 1908 (the beginning of the mine) to 1915 we paid our employees a bonus each Christmas, based on the earnings of the company, which averaged over 10 per cent. of their gross earnings for each year, and in one year was as high as 15 per cent.

Besides this, we carried an accident insurance for the men, towards which the men did not contribute a penny, which entitled them to half pay in case of accident. Both this and the bonus were unsolicited and were voluntary gifts by the mine. The total amount of this expenditure on a comparatively small mine like the Crown Reserve amounted to over $75,00.

At this time the Crown Reserve Co. is operating its mine at a loss, and while it is true, of course, that this is in hope of striking new ore bodies, it is also true that we are trying to give employment to our old and faithful employees as long as we possibly can.

Taking the Crown Reserve, therefore, for an example, and the past history on which we stand, is it not stupid on the face of it to assume, after we have voluntarily paid in bonuses to the men more than three times as much per year as the present 25 cents increase would amount to, that we refuse this for any reason whatsoever except that we honestly think that the increase is not justified?

Of course, the men of Cobalt want an increase in pay, but everybody wants an increase in pay. This not only applies to the mining industry of Cobalt, but to every other industry throughout the whole world, and is by far too big a question for us either to argue here or to particularly consider in this case.

All we can say is that wages paid to workers cannot be regulated by their desires. It depends mainly on two facts:

(1) The amount of wage necessary for a fair livelihood, the education of workmen's children, his protection in case of sickness; and

(2) The prevailing rate of wages for the same kind of labor in other portions of the country, under similar conditions.

Our answer to this is: "We claim the men of Cobalt earn as much money and are as comfortable and happy as any mine workers in Eastern Canada. In fact, we go further than that: we claim Cobalt is the best working place of any mining camp in Canada." We feel, as I have already said, most of the men are satisfied, do not wish to embarass their country by calling a strike at this critical time; in fact, the managers have not had a direct request from a committee of their own employees either for a raise in pay or a change in conditions. Most of the men are patriotic citizens. A large proportion of those present working are married. They are trying to earn a livelihood for their families and at the same time do the best they can for their country, but we also feel that there is a small minority who, with the lure of higher wages during this time of stress in the history of the Empire, are attempting to stir up dissatisfaction and discontent amongst our employees, for the purely selfish aggrandisement of the W. F. of M.

We wish it fully understood, that while we are at all times prepared and ready to discuss any grievances, to consider any complaints, to honestly try and meet our employees more than half way, we will not be taken by the throat by the W. F. of M. with the threat of a strike, and our answer is that if these trouble-makers do succeed in forcing a strike, we will absolutely close down the mines until our men are prepared to go back to work.

## NIPISSING.

A bonus of 5 per cent. along with the regular quarterly distribution of 5 per cent. was declared by the directors of the Nipissing Mines Co. last week.

The extra payment is the first to be made by Nipissing in nearly three years. From October, 1909, until the end of 1913 the company paid 5 per cent. plus 2½ per cent. extra every quarter, but the extra payment was dropped at the dividend meeting for the first quarter of 1914. Since then payments have been confined to the 5 per cent. quarterly.

Recent reports on the company's outlook have been encouraging and some time ago it was predicted that an extra disbursement would be made this quarter. The company has benefited by the higher price of silver, new development work has been satisfactory, and a new method of treating mill tailings is said to have been productive of satisfactory results. With the dividends declared October 2nd, Nipissing will have paid next month a total of 249 per cent. on its $6,000,000 capital.

## CANADA COPPER CO., LTD.

Developments at the Copper Mountain property of Canada Copper Co., Ltd., are understood to be proceeding satisfactorily. At Greenwood, B.C., the smelter has been in continuous operation during the entire year, and up to September there have been produced 3,455,578 lb. of copper, 8,555 oz. of gold and 33,096 oz. of silver.

## THE FLOTATION DECISION.

The following statement has been issued by Miami Copper Co. in regard to suit of Minerals Separation Co. for infringement of patents on the flotation process, which suit was decided against the Miami Co.:

"The bulk of our recovery of copper is by table concentration. Decision only affects comparatively small additional saving that is made by flotation, and our counsel are confident this decision will be reversed in higher courts."

## DOME.

The monthly statement of the Dome Mines Co., Ltd., just issued gives the amount of ore treated in their mill during the month, the total tonnage being 38,300, as against 40,010 for the month of August. The production was $179,500, about $500 less than the previous month, which was $180,000.

The grade of ore for September was on a par as that of August, at $4.49 per ton. The cost of operating was $2.59, compared with that of August of $2.56.

The cost of treating this ore at the mill per ton is as follows:

| | Per ton. |
|---|---|
| Estimated costs, mining, including hoisting | $ .76 |
| Development | .60 |
| Crushing and conveying | .10 |
| Milling | .82 |
| General expenses | .31 |
| Total operating expenses | $2.59 |

The National Chemical Copper Co. has taken over the development of the old copper mines near Dorchester, which have been closed for a number of years. A considerable number of laborers were employed, and it was expected to have the mines in operation at an early date.

# SUDBURY'S NICKEL INDUSTRY

The "Sudbury Mining News" published on Sept. 29th the following account of a visit of the Ontario Nickel Commission. The members present were: Chairman G. T. Holloway, Mr. McGregor Young and Mr. T. W. Gibson.

**Mayor Travers.**

Mayor Travers was first called and the chairman suggested that he give from personal experience his opinion as to the extent of the deposits, developed and undeveloped, the refining of nickel, the taxation of mining companies, etc.

Mayor Travers stated that he had been connected with mining in the district continuously for 25 years, during the past seven years had been engaged in contract work. Had developed the Whistle, Murray, Levack, Blezard, Elsie, Gertrude and other properties, all of which have large quantities of proven ore bodies, amounting to roughly 70,000,000 tons, all contained within 10 miles around the rim of the 130 miles of nickel bearing contact. The percentage is from 3½ per cent. to 6 per cent. nickel-copper, ratio of about two parts nickel to one of copper. In reply to a question as to what he considered a reasonable size for a working deposit, he answered from 300,000 to 9,000,000 tons, and to Mr. Young he stated the average would be about 4 per cent. The most promising surface showings only had been developed, but no doubt there was plenty more equally good. He thought in the early stages of the work that magnetic prospecting would be useful; his knowledge was based on his experience in the Levack field. He considered government reports and maps quite useful and mentioned particularly that of Dr. Coleman.

Mr. Gibson—Can you give an estimate of the quantities of ore held by people outside the large operating companies?

Mr. Travers—No. None have been proven up, except Mt. Nickel. The unproven deposits are mostly on the north range.

Mr. Holloway—What is your view as to taxation of mines and refining?

Mr. Travers—Taxation at the mouth of the pit is always preferable to taxation on ore deposits.

Mr. Gibson—Are you familiar with the conditions in Minnesota and Michigan, where the ore is taxed by proven deposits?

Mr. Travers—No, other than that it checks development of deposits and retards proper mining operations.

Mr. Gibson—Would this plan not be better than our present method?

Mr. Travers—No, the present plan is better. It is much better to tax net profits or ore at the mouth of the pit than the undeveloped property.

Mr. Gibson—Why not tax the mine as the farmer is taxed.

Mr. Travers—The farmer gets revenue even from land that is not tilled, but the mine owner gets nothing from his undeveloped lands.

**J. F. Black.**

Mr. J. F. Black stated that he has been in the district for 19 years, being interested in various claims as stockholder or owner. He claimed to be fairly familiar with all government reports and to have studied the geology of the district through these. Have had little or no experience in the development of deep mines, and considered the government reports reliable in a general way. With reference to taxation, Mr. Black favored taxation on net profits or at the pit head as much better than on undeveloped property, which would greatly retard progress.

Mr. Gibson—Have you any objection to the present system?

Mr. Black—It is all right, if properly carried out.

Mr. Gibson—In what respect is this law not carried out?

Mr. Black—Some operating companies should be paying a much larger tax to the province than at present, if they were taxed according to their profits. He referred to one company paying only $40,000 a year through special arrangements with the Government of Ontario, whereas it should pay several hundreds of thousands.

Mr. Gibson—Are you aware that the tax is on the value at the pit head, not on the matte.

Mr. Black—Yes, but as I see it the value must be at the pit head to get into the matte, for no values are added further during smelting or refining. The prospector's load should also be lightened, as at present it costs him from $1,000 to $1,500 to secure patent for a 40 acre claim, which was practically prohibitive. I also think the ore should be refined in Canada and that the refinery should be located at such a distance from the boundary as to permit of easy defence in time of war.

**W. E. Smith.**

Mr. W. E. Smith stated that he had not had much experience in nickel corporations, but was interested as an explorer. Is not in favor of taxing orebodies, as it certainly hinders development and might tend to force properties from small owners to larger ones, for the fact that the former could not pay his taxes.

**J. A. Holmes.**

Mr. J. A. Holmes said he came to the district as consulting engineer for the International Nickel Co. in the installation of their basic convertor plant six years ago. He afterwards became connected with the Dominion Nickel Co. as manager. They had invested heavily in developed properties which they considered good. They tried to prove them by magnetometric survey, but where the highest readings were the diamond drill found the least ore, but after a year and a half they had prospects of 1,500,000 tons of ore. Magnetic surveys are all right in certain cases, if you can interpret them correctly. The British America Nickel Corporation took over the holdings of the Dominion Co., and have now 17,500 acres of land in the district. The company bought and developed the Lake Superior Copper Co.'s claims and also that of the Viviano. These consist of 50 or 60 claims, of which we have developed 18. The Murray-Elsie is the largest, and we were proving up from 1,000,000 to 1,600,000 tons per month. The development work costs 2c. per ton. As to reserve supply and undeveloped ore, I think this district is only in its infancy. More producing companies will cheapen the product, so that it will become extensively used in nickel steel and in cooking utensils, which can be made directly from the matte like Monel metal, and in heat conducting qualities are far superior to aluminum, having the same cleanly appearance, are as easily cleaned, are quite as sanitary and much cheaper. The cry now is greater production and cheaper cost.

Mr. Gibson—Are you acquainted with the taxation conditions in Minnesota and Michigan?

Mr. Holmes—Yes. Taxation on unproved ore in the ground hinders development. A number of friends of mine in these districts, since that law came into force, have abandoned development work until necessity de-

mands it. The present Ontario method is the just one to all concerned.

**Russell Cryderman.**

Mr. Russell Cryderman, one of the veteran prospectors of the district, said he had been prospecting the nickel fields for the past 20 years. His experience had been almost entirely as a surface prospector.

Mr. Holloway—What is your opinion as to the opportunities for large undeveloped deposits?

Mr. Cryderman—There are good deposits all along the Eastern range in Capreol and Norman townships.

Mr. Young—These in your opinion would justify diamond drilling?

Mr. Cryderman—Yes.

Mr. Gibson—Are all prospects taken up?

Mr. Cryderman—Yes.

Mr. Gibson—Why are these not being developed?

Mr. Cryderman—Because the large companies have sufficient ore for present needs.

Mr. Gibson—What market would you have?

Mr. Cryderman—I don't know of any.

## GRANBY.

For the first time in its history Granby Consolidated did a gross business exceeding $10,000,000 in the year ended June 30 last. Of the $10,034,017 total, $9,299,337 came from the sale of its own copper, the balance, approximating $734,000, being derived from custom ores treated. Cost of producing copper at all properties rose from an average of 10.66 cents in the previous year to 12.30 cents in the past 12 months. This was due very largely to higher wages and greater cost of materials and supplies, although treatment of 330,000 tons of very low grade ore was a factor.

A feature of the past year's operations was the lower recovery of copper from the ore treated, the average being 22.36 pounds per ton against 23.99 pounds in the 12 months ended June 30, 1915. The greater loss was at the old Phoenix mines, from which the recovery was two pounds less per ton than in the previous year, while that at Hidden Creek dropped a little more than a pound. There was a new factor in the production as Granby's Alaska mines entered the producing ranks and contributed an average of 32.90 pounds of copper per ton, as well as high precious metal values from 66,617 tons of ore milled at the Anyox plant.

The following sets forth some production comparisons:

| | 1915-16. | | |
|---|---|---|---|
| | Tons ore. | Lb. rec. | Lb. cop. |
| Phoenix | 1,097,299 | 14.6 | 15,992,476 |
| Hidden Creek | 722,630 | 33.23 | 24,012,838 |
| Alaska mines | 66,617 | 32.90 | 2,192,796 |
| Total company's mines | *1,897,251 | 22.36 | 42,198,083 |
| | 1914-15. | | |
| | Tons ore. | Lb. rec. | Lb. cop. |
| Phoenix | 611,097 | 16.12 | 9,850,302 |
| Hidden Creek | 462,340 | 34.58 | 15,895,757 |
| Alaska mines | ..... | .... | ..... |
| Total company's mines | 1,073,437 | 23.99 | 25,746,059 |

*Including 10,705 tons from quartz mines which yielded an average of $7.24 per ton in gold and silver.

From custom ores purchased by the company and treated at its two smelters there was recovered over 3,000,000 lb. of copper, which brought the total of that metal turned out to 45,631,673 lb. Precious metal yield was 579,520 oz. of silver and 49,971 oz. of gold which realized over $1,200,000.

Ore reserves were increased from 18,000,000 to 23,000,000 tons. Phoenix mines did not replace with new ore the amount shipped by 721,409 tons, while at Anyox tonnage mined during the period exceeded new ore reserves to the extent of 182,833 tons.

J. P. Graves, one of the pioneers in Granby affairs, and for years its general manager and one of the largest stockholders, has completely severed his connection with the company. Through the choice of Henry Bruere, former city chamberlain of New York, as his successor, the American Metal Co., representation on the board of directors was increased to two members.

## WINDY ARM DISTRICT, BRITISH COLUMBIA.

Reports coming from the operators of the Conrad mining properties, in Windy Ann district, are most promising, says the "Daily Alaskan," Skagway. Already 1,200 sacks of ore from the Venus mine have been shipped to the Granby Co.'s smelting works at Anyox. This makes the third shipment of ore from the Venus, which is now being worked with energy and promises to prove a profitable property. Other shipments are to follow.

Mr. Jas. McFarland, superintendent for the Harper interests, who have taken over the chain of mines in the Conrad properties, states that development work is also being done on the M. and M. claim, which is situated in Polley gulch, and three men are breaking and sacking high grade silver ore for shipment from this mine. The minimum price obtained for ore under the Conrad management was $165 a ton; that now being got ready for shipment should bring in $180 a ton.

Preparations are being made, too, for active work at the Montana mine, where men have been engaged in clearing the workings of ice and water. In past years the Montana produced considerable ore of good grade, and it was known as one of the best mining properties in the district.

The outlook is most encouraging. Assays are showing that there is much valuable ore, and the manager is enthusiastic concerning the prospects. Work will be pushed throughout the winter at practically all the mines now being opened under Mr. McFarland's direction. A good force of men are working on the various properties, and it is expected shipment of ore will be continued through the winter as well as during the remainder of the autumn.

## ATLIN MINING DIVISION, BRITISH COLUMBIA.

The "Empire," published at Juneau, Alaska, says: The developments by the New York and Gloucester, Mass., capitalists on the Ruby Silver and Silver Queen mines on Lake Bennett, B.C., have demonstrated the property to be good. It is now shipping ore and will be extensively developed.

In addition to Lake Bennett development, mining properties on Windy Arm, near Carcross, are being developed. The Venus mine is already shipping ore and the Big Thing mine is being opened again. These are properties that were exploited several years ago by Col. J. H. Conrad.

The Engineer gold mine, on Atlin lake, has been producing for several years, and will continue to do so. It is now a rich property and has been opened in a manner that will insure its life for many years. It is claimed that ore to the value of $2,500,000 is blocked out in it, and development is being kept well ahead of mining.

# ZINC DEPOSITS OF MONTAUBAN TOWNSHIP, QUEBEC*

By J. A. Bancroft.

At Batiscan, about twenty miles below Three Rivers, the Batiscan river enters the St. Lawrence river from the north. On the banks of this tributary and forty-two miles from its mouth, the little village of Notre Dame des Anges it situated in Portneuf county, and on the Canadian Northern railway, 125 miles north of Montreal. In a straight line, this village is 51 miles slightly north of west of the city of Quebec, from which by the C. N. R. via Garneau Junction, it is 106 miles distant, or via Riviere a Pierre Junction, 68 miles.

In the autumn of 1910, Mr. Elzear Gauthier discovered zinc blends and galena on lots 39 and 40, range I., Montauban, about four miles south of the village of Notre Dame des Anges. Since that date the area has attracted the attention of a small group of mining men.

In 1911, Mr. Pierre Tetreault acquired that portion of the mineralized zone crossing lots 322-327, range I., Price, and lots 39-42, range I., S.W. Montauban. In 1912, Mr. Tetreault erected a concentrating mill on lot 40, with the hope of treating the complex ore of this area by the methods that are adopted in concentrating the zinc and lead ores of the Joplin district, Missouri. In 1913 and 1914, about 1,300 tons of high grade ore was shipped from rich pockets that were encountered in shafts 3 and 4, but the mill failed to produce a marketable grade of concentrates.

The mineralized zone was found to extend northeastward across lots 45, 44, 43 and into Block C, range I., S.W., Montauban, and other deposits of zinc blende were discovered on lots 7 and 8, range IV., S.W., Montauban. In 1914, the Laurentide Mining Co. began prospecting operations on lots 7 and 8, range IV., S.W., and the Montauban Mining Syndicate started work on lot 43, range I., S.W.

In October, 1914, the Weedon Mining Co., who own and operate the large deposit of cupriferous pyrite in the Eastern Townships, P.Q., leased from Mr. Tetreault a portion of the mineralized zone, 900 ft. in length, immediately south of the small lake on lot 40, and including shaft No. 3, which was then about 90 ft. deep. Ably directed by Mr. L. D. Adams, the superintendent of the Weedon Mining Co., development work was vigorously carried on, the concentrating mill was remodelled, and, as a result of numerous experiments, a method was devised whereby the ore can now be economically concentrated. In 1915, a separate company, the Zinc Company, Limited, was incorporated to operate this property. Up to June 1st, 1916, they had shipped 300 tons of high-grade zinc ore, and had passed 6,958 tons of ore through the mill.

### The Tetreault Property.

A small lake on lot 40, range I., S.W., Montauban township, southward from the margin of the mineralization is practically confined to a band of metamorphosed magnesian limestone, whose position is plainly marked by a depression. For about 400 ft. from the lake, the altered limestones vary from 35 to 60 ft. in width when, including a band of quartzites up to 15 ft. in width, they fork into two bands which gradually become narrower as they are followed along the strike. Judging from surface exposures, it would appear that for a distance of about 500 ft. southward from the lake, the altered limestones can be successfully worked for their irregularly distributed content of zinc blende and galena; farther southward only a few widely scattered grains of these minerals have been found.

In the southwestern corner of lot 40, at the hanging wall of the band of altered limestones, Mr. Tetreault sank a shaft (No. 3) to a depth of about 90 feet on a slope of about 60 degrees toward the southeast, on a large pocket of very rich zinc ore carrying a small percentage of lead. At a depth of 33 ft., drifting was extended for about 145 ft. toward the southwest. Seven or eight feet from the shaft a stope was developed, which attained a maximum height of about 20 ft. Fifty-five feet southwest of the shaft a raise was extended to the surface. Between 1,200 and 1,300 tons of high grade zinc ore were shipped by Mr. Tetreault from this shaft.

### The Zinc Company, Limited.

In October, 1914, the Zinc Co., Limited, leased shaft No. 3 from Mr. Tetreault and that portion of the mineralized zone extending 100 ft. northward and 800 ft. southward from this shaft. The shaft has been extended to a depth of 175 ft.

At a depth of 85 ft. drifting has been carried about 325 ft. towards the south. For about 160 ft. from the shaft, the drift is crooked and lies toward the hanging wall of the altered limestones where they are almost completely altered to tremolite, diopside, etc., within which the zinc blende and galena are disseminated in an extremely irregular manner; beyond this, the drift followed the footwall where the ore is less irregularly distributed. At a distance of about 160 ft. from the shaft, while raising to the surface, a rich pocket of ore was encountered, from which about 300 tons of an excellent grade of ore were obtained.

At a depth of 170 ft. drifts have been extended toward the north for 100 ft. and toward the south for about 225 ft. In the latter direction, the drift has followed quite close to the foot-wall, where the crystalline limestone is almost completely free from tremolite, diopside, etc., but is heavily mineralized with zinc blende, galena, pyrrhotite and a very few grains of chalcopyrite. Undoubtedly, some pockets of rich ore will be found to be very irregularly distributed within the more tremolite-rich portion towards the hanging wall. Northward from the shaft, the band of altered limestones is narrower and more irregularly mineralized.

In the course of this development work, 6,958 tons of ore, with an average content of 13 per cent. of zinc, 9 per cent. of iron and 3 per cent. of lead have been passed through the remodelled mill that originally had been erected by Mr. Tetreault. This ore yielded 1,225 tons of zinc concentrates carrying 42 per cent. of zinc, 10 per cent. of iron and 4 per cent. of lead; also 270 tons of lead concentrates with an average content of 63 per cent. of lead, 10 per cent. of iron, 8 per cent. of zinc, and carrying 60 oz. of silver, and about $10 in gold per ton of 2,000 lbs. It would seem to be a conservative estimate that on June 1st, 1916, about 50,000 tons of ore of similar average grade to that milled has been blocked out in the mine.

* Extracts from a report published by the Department of Mines, Quebec.

### The Montauban Mining Syndicate.

That portion of the mineralized zone which crosses the southeastern corner of lot 45 and the southern portions of lots 44 and 43 is controlled by a group of men from Massachusetts, who have organized the Montauban Mining Syndicate, with Mr. E. J. Thibault as manager. They began work on the property in August, 1914.

The Montauban Mining Syndicate has not shipped any ore. For the most part, rock and ore have been accumulated together in the dump, while they have been looking forward to the construction of a concentrating mill. By handpicking the dump and including the ore that has been placed in sacks and on the floor of the shaft-house, it is probable that about 25 tons of high grade zinc ore, carrying a few per cent. of lead, could be sent to market. Sufficient ore has not been developed to warrant the erection of a mill.

### Mode of Occurrence of Ore.

The occurrences of zinc blende and galena within this area are chiefly confined to a portion of a zone of highly altered sedimentary rocks, which, with a length of nearly two miles and with a strike that varies from N. 10 deg. to 35 deg. E, dips steeply toward the southeast, and extends across lots 322-327, range I., Price, and lots 39-45, range I., S.W., and into Block C, range II., S.W., of Montauban township.

From lot 322, range I., Price, into lot 41, range II., S.W., Montauban, the mineralization is confined to a band of altered limestones that varies from a few feet to 60 ft. in width, and locally includes certain narrow bands of quartzites and mica schists. In general, the limestone has lost all semblance of its original character, since it has been changed chiefly into tremolite together with diopside, phylogopite, biotite, actinolite, scapolite, wilsonite, anorthite, apatite, epidote, garnet, titanite, quartz and recrystallized calcite and dolomite; a little chlorite and talc have been developed locally, because of the alteration of the micas. This band is irregularly mineralized with zinc blende, galena and pyrrhotite, and a few scattered grains of pyrite and chalcopyrite; in some places, small crystals of arsenopyrite and a few small flakes of molybdenite and of graphite have also been found.

In a very few places and especially in a small opening close to the boundary between lots 323 and 324, range I., Price, the crystalline limestone contains a relatively small proportion of the minerals that have been developed through processes of contact metamorphism. Where the band locally widens, it is more completely changed to these minerals towards its hanging-wall than in its lower portions. In general, however, the altered band of impure dolomitic limestones now consists of a closely matted aggregate of fibrous tremolite within which the other minerals mentioned are irregularly distributed.

### Suggestions to Prospectors.

The discovery of these deposits of zinc blende and argentiferous galena in the vicinity of Notre Dame des Anges should stimulate prospecting in adjacent districts. Experience has taught that it is useless to prospect for ore deposits of value within the widespread areas occupied by the gneissoid granits and granodiorites. Attention should be devoted to those areas underlain by rocks into which the granites and granodiorites are intrusive. Undoubtedly, within widespread areas adjacent to the ore described in this report, there are numerous small, and possibly some extensive, areas where remnants of the highly metamorphosed stratified rocks of the Grenville Series are present. These rocks, and especially any altered limestone bands that they may include, should be carefully examined in the hope of discovering valuable minerals. Prospecting endeavor should not be restricted to a search for zinc blende and galena, because from analogy with other areas farther southward, where the Grenville Series has been more thoroughly prospected, it is possible that deposits of graphite, magnetite, pyrite, apatite, "amber" mica, barytes, magnesite, talc and possibly some quartz veins carrying gold may be found.

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## NEEDS OF MINING CAMPS.

Timmins, Oct. 4.—The meeting of the Ontario Nickel Commission, under the supervision of Prof. MacGregor Young, K.C., and Mr. Gibson, Deputy Minister of Mines, met in the Empire Theatre on Monday afternoon, Oct. 2, at 2 p.m. The representatives present to look after the interests of the district were. Mr. R. W. Robbins, of the Hollinger Gold Mines; A. R. Globe, J. P. McLaughlin and Mayor Wilson, of the City Council; and G. H. Gauthier and W. H. Wilson, of Tisdale Township.

Mr. Robbins' claim laid before the Commission was that the taxes derived from the mines should be spent in the building up of the district. "The town," he stated, "in 1912, only had about four houses in it, and it had made wonderful strides since that time, but more money was needed to cope with the ever-growing population to provide necessities for their welfare, such as waterworks, sewers, sidewalks, schools, etc."

His base of argument to the Commission was that whereas the camps only were receiving one per cent. of the tax from the mines they should be receiving at least one and a half per cent.

Mr. A. R. Globe, who was present on behalf of the Town Council, told the Commission that the municipality needed immediately about $300,000 to build an addition to the water works, to build a new school, fire hall, more sidewalks, the clearing up of the bush around the town for the safety of its citizens, and that in the course of another year there would be money needed for sewerage disposal plant, and various other items were needed. He also stated that debentures could be issued for some of these, but people would not buy them, because of the dangers from forest fires, unless the Government would guarantee the bonds.

J. P. McLaughlin and Mayor Wilson were much the same opinion as A. R. Globe.

Clerk W. H. Wilson, of Tisdale Township, submitted a statement of taxation and assessment system as worked by that township. The clerk stated that the township was badly in need of money to make improvements that were necessary, such as schools, etc.

G. H. Gauthier, of Porcupine, also a representative for Tisdale Township, was of practically the same opinion as Mr. Robbins, except that he claimed the township should be allowed to assess at a rate of from 20 to 30 mills on the dollar if necessary, whereas the Mining Act only allows for an assessment of 10 mills. He also thought that mining claims held by prospectors who started operations and failed to carry them through and were holding up the property, thereby preventing other prospectors from buying and working them should be taxed heavier in order to induce the workings of those claims.

# SULPHUR IN STEEL

That sulphur is not harmful as a constituent of low-carbon steel is the contention of Mr. C. R. Hayward in a paper prepared for the next annual meeting of the American Institute of Mining Engineers. Mr. Hayward writes in part:

Sulphur has long been one of the banes of the steel manufacturer and often no effort and expense have been spared in order to reduce it to a small per cent. in the finished product. This condition is due to a general conviction that in many cases where steels have failed in service, sulphur has been the cause. But there has been a growing feeling in recent years that the verdict against sulphur has been unnecessarily severe. In cases of segregation it was present in augmented amounts along with other impurities, but it had not caused the segregation. High sulphur in pig iron is caused by poor furnace conditions and the sulphur is merely one indication of an iron that has not been properly reduced. No amount of subsequent treatment under oxidizing conditions in the openhearth furnace can remedy the defects, although the per cent. of sulphur may be considerably reduced. In other words, the causes of bad steel can frequently be traced back to bad pig iron, and sulphur is merely one indication that the pig iron is bad. The writer recently visited a steel plant where a mass of evidence had been accumulated which substantiated this fact, and the superintendent was emphatic in stating that high sulphur was not harmful provided the steel was not otherwise poor due to insufficient reduction in the blast furnace.

The presence of a moderate amount of sulphur is desirable from the standpoint of the man who machines the steel. The low sulphur material drags and the production of a smooth surface is very difficult. A slight increase in sulphur enables the machinist to produce a smooth surface without difficulty.

Since, therefore, such large quantities of steel are subjected to machining, it becomes highly important that the sulphur controversy should be settled, and if its presence is proved to be harmless the ban on it should be lifted.

Among the recent papers on the effect of sulphur on steel is one by Dr. J. S. Unger, manager of the Central Research Bureau, Carnegie Steel Co. The results of an exhaustive series of tests are given and the conclusion states: "The author does not advocate paying no attention whatever to sulphur content in steel, but believes firmly that a steel containing less than 0.100 per cent. is not necessarily bad, and that it will show little, if any, difference in quality when compared with the same steel of much lower sulphur, other conditions being the same."

Mr. Hayward carried out a series of tests on steels of different sulphur content. The steels finally selected were in the form of ¾-in. round bars. Two bars of each grade were required to furnish sufficient specimens. The analyses below show the percentage content of sulphur, phosphates, etc.:

| Mark | Carbon | Total Manganese | Excess Manganese | Phosphorus | Silicon | Sulphur |
|---|---|---|---|---|---|---|
| 1 | 0.18 | 0.55 | 0.48 | 0.007 | 0.01 | 0.038 |
| 1A | 0.18 | 0.57 | 0.50 | 0.009 | 0.02 | 0.041 |
| 2 | 0.17 | 0.67 | 0.52 | 0.008 | 0.01 | 0.086 |
| 2A | 0.18 | 0.70 | 0.55 | 0.010 | 0.03 | 0.087 |
| 3 | 0.18 | 0.80 | 0.54 | 0.006 | 0.02 | 0.152 |
| 3A | 0.17 | 0.80 | 0.55 | 0.011 | 0.03 | 0.148 |

From the results of tests on these steels, Mr. Hayward concludes:

"The summary of the tensile tests shows that the high-sulphur steel has for each treatment the highest breaking load, while the yield point ranks first for two treatments, second for three and third for two. From this we may conclude that the sulphur does not lower the tensile strength.

"The figures for elongation and reduction of area show that there is little difference in ductility between the low- and medium-sulphur steels, but the ductility of the high-sulphur steel is slightly lower than the other two for most of the treatments.

"The average figures for the shock tests, except for the air- and furnace-cooled specimens, are highest for each treatment in the case of the sulphur steels and lowest for each treatment for the high-sulphur steels. The widest difference appears in the steels which have been quenched and reheated.

"It is difficult to draw definite conclusions from the results because of the newness of the shock test and the difference of opinion among engineers regarding its value. The tensile tests are not unfavorable to steels with moderate amounts of sulphur, while the shock tests show a decided falling off in strength as the sulphur increases. Until the interpretation of the results from the Charpy machine is more fully understood, it is impossible to say to which set of tests the most importance should be attached."

## NOVA SCOTIA STEEL.

Boston, September 25.—It is expected that Nova Scotia Steel shares will be introduced on the New York board some time next month. This is the earliest that the listing committee can rule on the subject. The listing notices will contain some interesting items of information. They are expected to show for one thing that the company is earning between 50 and 60 per cent. on its $7,500,000 common without including any net from the Eastern Car Co. and without any income from its immense ore reserves.

## STEEL CO. OF CANADA.

The August statement presented at the monthly meeting of the Steel Co. of Canada held in Toronto last week is said to have reflected the largest production in history and with the orders on hand the outlook was excellent, according to directors.

The question of a dividend on the common stock was not considered. The suggestion that the directors should take the shareholders into their confidence regarding the progress of the company did not meet with favor, and it was decided that there was no satisfactory reason for departing from the ordinary practice of withholding all reference to the affairs of the company until the results were definitely known at the close of the year.

The regular preferred dividend of 1¾ per cent. was declared.

The Sullivan Machinery Co. announces that Mr. Burt B. Brewster, for the past two years manager in Alaska, with headquarters at Juneau, has been transferred to Salt Lake City, to become manager at the company's branch office at that point, succeeding Mr. H. E. Moon, resigned. Mr. Walter F. O'Brien, for some time past associated with Mr. Brewster at Juneau, will take his place as local manager for Alaska.

## THE BROWNIAN MOVEMENT.

Our readers will recall the article on "Canada's Future," by Mr. David H. Browne, which was published in the July issue of The Canadian Mining Institute Bulletin, and reprinted in this journal. Mr. Gilbert Rigg has written to Mr. Browne the following letter for publication in the Bulletin. It appears in the October number:

My dear Browne,—I have received the Canadian Mining Institute Bulletin for July and your letter, for both of which my best thanks. I am immensely pleased with your paper. I feel that we are on the right track.

There has been an enormous amount of stuff published on these lines, but by men who for the most part are outside the industry and who approach the subject from an ethical standpoint without regarding the necessity for keeping the wheels turning. Our aim must be to land the subject where it belongs—in the hands of the men who have been accustomed to do big things in a big way.

There ought to be one or more first class men in every concern, reporting to the general manager, and charged with the question of the co-ordination of the producing classes. We have all sorts of engineers in America mining engineers and milling engineers; metallurgical engineers, engineers of sales and of methods; why not an engineer of industrial relations whose duty it would be to study the legitimate needs and demands of all who are interested in this company from the stockholders to the laborers. His duty would be the equalization of the claims of each, as far as the facts of the case would permit.

Really Browne, it's surprising that this thing should not have been done long ago. Look at the conditions to-day. Outside of the beautifully co-ordinated organization of general manager, superintendents, department heads, engineers and so forth is the great formless mass of labor, regarded for most part with suspicion, tinged not infrequently with apprehension, and articulate only, for the most part, through men whose principal claim to the position of spokesman is greater strength of character, force of lung, and recklessness. Its main argument is the strike and more recently the ugly threat of sabotage. This standing for a base ideal, that it is not well for a man to do his best, is their reply to the co-called efficiency engineer with his stop watch and his demand for speeding up all along the line.

Look at the railroads to-day with their backs to the wall, plastering every station with appeals to their passengers concerning the demands of their workmen. It is absolutely pathetic in its helplessness. Railroading in America appealed to me during my ten years' sojourn in the States as an achievement bordering on the marvellous. Yet, with all the excellence of organization and equipment that men of genius have built up, it has been no man's job to see that the men who handled the trains were built into the organization and were made to feel that they were a part thereof, and that their prosperity rose and fell with the whole prosperity of the company.

Assuming for the moment that we can, and will, attempt the solution of this problem, where, as practical men, should we begin?

In the first place we need facts. We should have before us statistics showing the respective earnings of capital and labor over many years. What is and what has been the relation between wages paid and dividends declared in various industries? What again has been the relation between wages earned and the cost of living as shown by the price of necessities?

We must use the historic method, inquiring into the real causes of strikes and "lockouts," getting not only the facts, but the mental attitudes produced by those facts. We must lay out the problem before we can seek for the answer.

It cannot be too strongly emphasized that this is a job for the strongest men in the nation; unless big business takes a hand in this thing it is not going through. Look at England. Our friend Riordan was over there at the outbreak of the war, hoping to get distressed Americans home, and he told me of the astonishing disaffection of the laboring classes as it was illustrated by men with whom he had talked. Yet out of this material Kitchener built an army and Lloyd George established a common purpose. We all know of the strikes and labor troubles that arose at first. The common danger was not enough, to consolidate clashing interests. It needed the right men to take the lead.

And we must somehow or other get the co-operation of the labor leaders. Whatever may be their shortcomings they understand the psychology of their followers far better than we do. They have solved the problem of getting men to sacrifice their immediate interests for a common aim.

One of the most important points you have brought up is the use of men's leisure. The eight hour laws leave much spare time to be utilized; many of the proposals to make use of this have failed because they were simply recreative. This time must be made profitable. That is why farming, gardening and poultry keeping are so popular. The results are tangible and personal. There isn't a man breathing who is not the better for a hobby.

When I started to write this letter I intended to make it a brief acknowledgment of yours and to write a reply to your paper later. I am going to make this letter my reply, and the essence of it is this: The hour for a thorough re-establishment of these relations is now; the place is here. Can we find the man?

And so, once more, I make you my executor; take what you will of this and my previous epistles and send it to the Bulletin as my contribution to the "Brownian Movement."

GILBERT RIGG.

Associated Smelters Proprietory, Limited,
Melbourne, Aust., August 20, 1916.

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## KERR LAKE.

The annual report of the Kerr Lake Mining Co., made public this week, shows net profits of $813,702 for the year ended August 31st, comparing with a net of $550,774 in the previous year. The balance sheet shows a profit and loss surplus of $1,033,570, the cash item showing an increase from $265,777 on August 31st, 1915, to $545,059 on August 31st, 1916. Production during the year was 2,433,793 oz., yet at the close of 1916 ore reserves were estimated at 3,827,000 oz. of silver, comparing with 4,172,400 oz. at the close of the previous year.

The statement indicates that Kerr Lake, in spite of a year of heavy production, has brought into sight nearly an ounce of silver for every ounce extracted. Costs during the year were 25¼ cents per ounce.

# THE OCCURRENCE OF NICKEL ORES*

Nickel is one of the metals that are of especial interest at the present time in connection with the manufacture of alloys, notably steel alloys. Nickel finds its chief use in the production of nickel steel, which is one of the most valuable of the special steels. Its use as an alloy with copper and zinc in imitation of silver, under various names, has long been known.

Nickel was discovered by Cronstedt in 1751 in a cobalt ore from Helsingland, Sweden. The element was found later by Cronstedt in the mineral niccolite (nickeline, nickelite or copper nickel), an arsenide of nickel, and it was presumably in the form of this mineral that nickel was present in the Swedish cobalt ore in which Cronstedt discovered the element. By German miners the mineral niccolite was known as kupfernickel (false or worthless copper), from its fancied resemblance to copper, and it was from this name that the name nickel was derived.

Formerly the amount of nickel ore required was small, and the supply was obtained from European deposits, notably those of Scandinavia, and from certain deposits in the United States.

The discovery of nickel ore in New Caledonia was made in 1865 by M. Jules Garnier, after whom garnierite, the chief nickel mineral found there, was named. Little mining was done in New Caledonia before 1875, however, though this locality soon after became the chief source of supply.

It was at a later date than this that the importance of the copper ores of Ontario came to be recognized as a source of nickel. Nickel was reported to occur in the Sudbury district of Ontario as early as 1856, but it was not until this region came to be opened up by the Canadian Pacific Railway in 1883 that important deposits were discovered. The copper ore originally mined at Copper Cliff, where mining commenced in 1886, was not suspected to contain nickel, and it was not until 1888 that the production of copper-nickel matte commenced. The Canadian output grew rapidly from that date, and Ontario soon took first place in the world's nickel production. This place it has since held, and its only serious competitor at present is New Caledonia.

### Nickel Minerals.

The chief nickel minerals are nickeliferous pyrrhotite (iron sulphide), pentlandite (sulphide of iron and nickel), and garnierite (hydrated nickeliferous magnesium silicate). Other nickel minerals of some note include millerite and polydymite (nickel sulphides), niccolite and chloanthite (nickel arsenides), gersdorffite (sulpharsenide of nickel), and annabergite (hydrated arsenate of nickel).

Pyrrhotite, also known as magnetic pyrites, is a sulphide of iron approximating in composition to the protosulphide (FeS), but with a slight excess of sulphur over the amount required by this formula. The mineral frequently contains nickel, usually in the form of pentlandite. It is occasionally found in the form of tabular hexagonal crystals, but is usually massive. It is an opaque mineral, pale bronze-yellow to brown in color, with a metallic lustre, and is highly magnetic. Its hardness is about 4, and specific gravity 4.6.

Pentlandite is a sulphide of iron and nickel of variable composition, but usually corresponding to the formula (Fe,Ni)S. It occurs as inclusions in pyrrhotite, and is the chief nickel mineral of the Sudbury deposits. It crystallizes in the cubic system, and shows an octahedral cleavage. The mineral is opaque, pale bronze-yellow in color, with a metallic lustre. When free from pyrrhotite it is only weakly magnetic.

Garnierite, sometimes called noumeite or genthite, is, as already mentioned, the nickel mineral of the New Caledonia deposits. It is a hydrated silicate of magnesium, containing a variable amount of nickel, which ranges from 2 or 3 per cent. up to 30 per cent. or more. The mineral occurs as a compact earthy material in the form of veins traversing serpentine. It varies in color from pale green to dark green, whilst the hardness and specific gravity are also variable, the former ranging up to 3, and the latter from 2.27 to 2.87.

Niccolite, or kupfernickel, is an arsenide of nickel (NiAs), belonging to the hexagonal system, but is usually found massive. It is an opaque mineral, of pale copper-red color, with a metallic lustre. The hardness is about 5½, and specific gravity 7.5. Weathered specimens turn green owing to the formation of annabergite.

Millerite is a sulphide of nickel (NiS). It crystallizes in the rhombohedral system, but is usually found in the form of hair-like growths. It is opaque, brass-yellow in color, with a metallic lustre. The hardness is about 3½, and specific gravity 5.65.

Gersdorffite is a sulpharsenide of nickel (NiAsS) belonging to the cubic system. The mineral is opaque, white in color, often with a grey tarnish, and has a metallic lustre. Its hardness is about 5½ and its specific gravity varies from 5.8 to 6.2. As in the case of niccolite, weathered specimens turn green through the formation of annabergite.

Chloanthite is a nickel diarsenide ($NiAs_2$) usually with appreciable amounts of cobalt and iron replacing the nickel. It crystallizes in the cubic system. It is an opaque mineral, tin-white in color, with a metallic lustre. The hardness is about 6, and the specific gravity varies from 6.4 to 6.8. Weathered specimens of this mineral turn green owing to the formation of annabergite.

Annabergite is a hydrated arsenate of nickel ($Ni_3As_2O_8,8H_2O$). It usually occurs as an apple-green, earthy alteration product on weathered specimens of nickel arsenide minerals, and is of importance as an indicator of the presence of these minerals.

### Nickel Ores in Europe.

**United Kingdom.**—Nickel minerals occur in veins of copper ore in Cornwall, and niccolite was formerly worked to some extent at the Pengelly mine, St. Ewe; whilst pentlandite is stated to have been found in some quantity at the Wheal Jane lead mine near Truro. Millerite is reported to occur in certain clay ironstones of the South Wales Coal Measures, notably those about Merthyr Tydvil.

According to the Home Office Mines and Quarries Report (Part III.), nickeliferous asbolan was formerly obtained in small amounts in Flintshire. The Report also states that nickel mining was started in Kirkcudbrightshire in 1897, and that 300 tons of ore, valued at £300, was raised.

**Austria-Hungary.**—At Schweidrich, near Schluckenau in Bohemia, there is an occurrence of nickeliferous pyrrhotite impregnating a basic dyke that tra-

* Extracts from an article published in the Bulletin of the Imperial Institute, London.

verses granite. The deposit, however, is of no economic importance.

Nickeliferous cobalt ore was formerly worked at Dobschau in Hungary.

**Germany.**—Nickel mines were formerly worked at St. Blasien in the southern Black Forest. The ore here is nickeliferous pyrrhotite associated with pyrite and chalcopyrite, occurring in association with basic intrusive rocks of the gabbro type.

Nickeliferous copper ores containing on the average 12 to 15 per cent. of copper and about 3 per cent. of nickel were formerly worked at the Hulfe-Gottes mine, Nanzenbach.

Nickeliferous cobalt ores occur in the Harz and the Saxon Erzgebirge.

A notable German deposit of nickeliferous pyrrhotite is that of Sohland in Lausitz, Saxony. Here the occurrence resembles that already mentioned at Schweidrich in Bohemia. The ore occurs in a basic dyke, and as mined it contained from 5½ to 6 per cent. of nickel, together with some copper. The ore occurs at the margin of the dyke in contact with the enclosing granite.

Nickel ores have been worked at mines situated to the north of Frankenstein in Silesia. The ore occurs as a fissure-filling in serpentine and usually contains from 0.5 to 3 per cent. of nickel. Less commonly, ore containing from 4 to 18 per cent. has been obtained.

**Greece.**—A deposit of nickel ore of some importance is stated to occur on the Greek island of Locris, east of Athens. The mine commenced operations as one of iron-ore. Below the iron ore a deposit of nickel ore, consisting of earthy brown material, with patches resembling garnierite, was obtained. A sample of the ore was found to contain 7.22 per cent. of nickel. The nature of the deposit suggests that it has probably been formed by the weathering of nickeliferous serpentine. Material from this deposit has been smelted at Evje in Norway.

**Italy**—At Varallo in Piedmont a basic intrusion consisting partly of norite contains nickeliferous pyrrhotite. Mines were formerly worked at this locality.

**Norway**—Nickeliferous pyrrhotite deposits similar in character and mode of origin to those at Sudbury in Canada occur in various parts of Norway. The pyrrhotite occurs as a segregation product in norites that are intrusive in gneisses and schists. A notable occurrence is that of the Flaad mine (Evje mine) near Evje, where a large amount of nickel ore has been mined. The ore deposit here occurs partly within and partly at the margin of an intrusive mass of gabbro and norite. The ore contains a high percentage of pyrrhotite associated with chalcopyrite. Selected ore contains 4.6 per cent. of nickel and 1.5 per cent. of copper; but the average values are stated to be 2.3 per cent. of nickel and 1.2 per cent. of copper. Another notable productive deposit of pyrrhotite in norite is that of the Erteli mine, near Ringerike.

The ore from the Flaad mine is smelted to a matte at Evje, and that from Erteli mine at the Ringerike nickel works. The matte is refined at Christiansand by a special electrolytic process known as the Hybinette process, from its inventor, N. V. Hybinette.

In this process the matte is first roasted and converted into oxides. It is then leached with weak sulphuric acid to extract copper sulphate, after which the residue is heated with sulphuric acid to a temperature at which hydrous sulphates do not exist. It is then again leached with weak sulphuric acid to extract copper sulphate. Afterwards it is heated with hydrochloric acid to a temperature sufficiently high to cause partial decomposition of the anhydrous chlorides, and again leached with weak acid, the heating being repeated if necessary. The ultimate residue thus obtained contains nickel oxide which can be refined by ordinary means.

According to the Diplomatic and Consular Report on Norway for 1913, the output of ore at the Flaad mine for that year was 28,000 tons. A small amount of ore was obtained also from the Faeo mine near Haugesund. A quantity of ore, amounting to 19,000 tons, from the Erteli mine was smelted at the Ringerike nickel works, which are now leased by the Christiansand nickel refining company. The amount of imported ore smelted at Evje and Ringerike during 1913 was 3,000 tons. The Hybinette refining process at Christiansand produced 600 tons of nickel and 350 tons of copper during 1913, as compared with 400 tons of nickel and 200 tons of copper in 1912. Some platinum, palladium, gold and silver were obtained as by-products.

**Russia**—A deposit of nickel ore of the garnierite type occurs at Rewdinsk in the Urals, south-west of Ekaterinburg. It occurs in an almost vertical quartz vein, about 6 ft. thick, which traverses serpentine rocks. The ore contains from 4.8 to 19.2 per cent. of nickel oxide, but the deposit is small. Several attempts have been made to work the deposit.

In the Verkhne-Ufalei district to the south-east of Rewdinsk, H. W. Turner reports the occurrence of nickeliferous pyrite in the Nijni-Kardadinsk mine (Bull. Amer. Inst. Min. Eng., 1914, p. 191). in a black carbonaceous deposit. This carbonaceous material contained 14.85 per cent. of fixed carbon, 26.55 of volatile matter, 35.65 of moisture, and 1.69 of nickel and cobalt. The ash obtained by burning the carbonaceous matter constituted 22.9 per cent. of the sample and contained 7.2 per cent. of nickel.

The orebodies at this and other mines in the district are iron ore consisting of a mixture of chalybite and limonite and are associated with deposits of nickeliferous serpentine. Nickeliferous pyrite occurs in the limonite-chalybite deposit. The deposit has been tested by boring and an average sample of the iron ore, representing about 40,000 tons of ore, was found to contain 0.75 per cent. of nickel. A sample of pyrite obtained by concentrating the crushed ore was found to contain 6.28 per cent. of nickel.

**Spain.**—Niccolite associated with chromite occurs in a mass of serpentinized peridotite at Los Jarales, 35 km. northwest of Malaga. At and near the surface the ore is altered to garnierite. The deposits are stated to be small in extent.

**Sweden.**—At various localities in Sweden, notably at Klefva in Smaland, nickel ores occur, and were formerly worked to a small extent. These Swedish occurrences resemble those of Norway.

**Switzerland.**—Nickel ore occurs in the Gollyre and Grand Praz mines, near Ayer, in the Val d'Anniviers. An ore averaging 3 to 4 per cent. nickel, 7 to 8 per cent. cobalt, and 2 to 3 per cent. bismuth is stated to occur at Kaltenberg in Turtmanntal.

### Nickel Ores in Africa.

**Union of South Africa.**—A promising deposit of nickeliferous pyrrhotite, closely similar to that at Sudbury in Canada, occurs at Insizwa, Cape Province. Here, as at Sudbury, there is a basin-shaped mass of intrusive norite, from 2,000 to 3,000 ft. thick, lying in the shales and sandstones of the Beaufort series of the Karroo system.

The ore when fresh consists chiefly of pyrrhotite, pentlandite and chalcopyrite. There are two different

kinds of ore, one rich in chalcopyrite with only a small amount of nickel, the other rich in pyrrhotite and pentlandite, with a larger proportion of nickel. Bornite and niccolite also occur in the ore. The ore contains platinum, probably in the form of sperrylite.

The following is a summary of the values yielded by material obtained from the adits of the Insizwa mining area:

Maximum—Copper, 19.3 per cent.; nickel 7.3 per cent.; platinum, per ton of 2,000 lb., 4 oz. 19 dwt.

Minimum—Copper, 1.2 per cent.; nickel, 0.6 per cent; platinum, per ton of 2,000 lb., 12 grains.

Average of fourteen analyses—Copper, 4.1 per cent.; nickel, 3.8 per cent.; platinum, 2 dwt. 15 grains.

Cobalt, silver, gold and osmiridium are present in traces.

Two trial shipments of about 5 tons each were sent to England. Samples from these, on analysis, gave the following results:

Copper—1, 3.4 per cent.; 2, 3.5 per cent.

Nickel and cobalt—1, 4.9 per cent.; 2, 5.25 per cent.

Gold—1, 6 grains per ton; 2, 6 grains per ton.

Platinum—1, 2 dwt. 12 grains per ton; 2, 12 dwt. per ton.

Silver—1, 10 dwt. per ton; 2, 12 dwt. per ton.

There appears to be no doubt that these ores of the Insizwa range are genetically connected with the intrusion of norite, and that they segregated from the norite magma in the same way as the Sudbury ore. (See Report by A. L. Du Toit in the Fifteenth Ann. Rep. of the Geol. Commission, Cape of Good Hope Dept. of Mines, 1910).

A basic laccolitic intrusion, including some norite, occurs in the Tugeli mountains of Natal under geological conditions resembling those at Insizwa. In this intrusive rock occurs a deposit of nickel ore, consisting of nickeliferous pyrrhotite associated with chalcopyrite.

**Nyasaland.**—Nickeliferous pyrrhotite, similar to that of Insizwa and Sudbury, occurs in the Blantyre district of Nyasaland, where it is found in masses of norite. A sample examined at the Imperial Institute some years ago was found to contain pyrrhotite, chalcopyrite and possibly pentlandite. It contained 41.28 per cent. of iron (present as sulphide), 3.96 per cent. of nickel, 0.28 per cent. of cobalt, and 0.99 per cent. of copper. A trace of platinum also was present.

**Madagascar.**—Madagascar possesses deposits of garnierite in serpentine similar to those of New Caledonia (see below). Such a deposit is found at Valojoro, near Ambatofangehana. A sample of garnierite at this locality was found to contain 26 per cent. of nickel oxide (NiO).

A deposit containing ore, with an average of from 3 to 4 per cent. of nickel, is stated to have been opened up near Ambositra, not far from a waterfall capable of supplying power for mining and smelting the ore.

### Nickel in Australasia.

**Tasmania.**—Nickel minerals are reported to occur in several of the western districts of Tasmania. In the Zeehan tin-field veins of the nickel-silver-cobalt type occur, and the mineral niccolite occurs in some abundance in the veins. At Trial Bay deposits of the garnierite type occur in serpentine, associated with pentlandite and niccolite. In the Zeehan district the mining of nickel ore has been carried on recently by the Dundas Currie Mining Co., Ltd., and by the Copper-Nickel Prospecting Syndicate; but mining was stopped at the outbreak of the war owing, it is stated, to their inability to dispose of the ore. During 1914 the Copper-Nickel Prospecting Syndicate sold 3,089 tons 4 cwt. of copper-nickel ore for £15,815. The metal contents of the ore were about 10 per cent. nickel and 4½ per cent. copper.

**New South Wales.**—Nickel ore occurs at Port Macquarie in New South Wales. This occurrence resembles that in New Caledonia. The nickel ore occurs in nests and pockets scattered irregularly through a mass of serpentine and the clayey material resulting from the decomposition of the serpentine. The most promising deposits occur at the base of red ferruginous clays and in the upper layer of the decomposing serpentine. The ore is a nickeliferous asbolan. An analysis of an average sample gave 31.05 per cent. of manganese dioxide, 7.48 cobalt oxide (CoO), 1.36 nickel oxide (NiO), 0.41 chromic oxide ($Cr_2O_3$), and 0.05 per cent. copper oxide (CuO). A picked sample contained 7.03 per cent. cobalt oxide and 2.39 per cent. nickel oxide. The ore appears to be too irregular and uncertain to make its working profitable, and none has been mined at this locality since 1904.

**New Caledonia.**—The only nickel ores of the world comparable in commercial importance at the present time with those of the Sudbury district of Ontario are the garnierite ores of the island of New Caledonia, a French colony in the Pacific in latitude 22 deg. S., and some 800 or 900 miles east of the Queensland coast of Australia. The ore has been mined chiefly in the Thio district on the east side of the island.

Geologically, New Caledonia is made up of ancient schists and Mesozoic sedimentary rocks and an extensive series of intrusive igneous rocks. Included in the igneous rocks are large masses of peridotite (olivine rock), which have suffered hydration to a large extent and become converted into serpentine. The serpentinized peridotites stretch along a mountain chain from the southeastern portion of the island towards the northwest end. It is in these serpentines that the garnierite deposits occur, in the form of veins and concretionary masses. The unaltered olivine rock contains nickel, sometimes in considerable quantity, and certain samples of peridotite are reported to contain as much as 2½ per cent. of nickel.

It is, however, in the garnierite veins traversing the serpentine that the rich deposits occur. The richer garnierite contains from 20 to 45 per cent of nickel oxide (NiO), and there is a vast amount of poorer silicate containing a lower but still considerable percentage of nickel. The ore grades from rich garnierite vein-like deposits to poor nickeliferous earth containing only a small amount of nickel. The extreme result of decomposition of the peridotite is the formation of a red clayey material, much of which is associated with the nickel ore.

The rich ore is found at and near the surface, where it occurs in the form of weathered sheets up to 20 ft. in thickness, and is worked in open quarries. Formerly a fairly rich ore, containing up to 12 per cent. of nickel, was produced. Latterly it has been the practice to mix poorer material with the richer ore, to produce an ore containing some 5½ per cent. of nickel in the condition of a hydrated silicate, the percentage being raised to an average of from 6½ to 7 per cent. on drying at 100 deg. C.

Nickel is exported from New Caledonia partly in the form of ore and partly in the form of matte. There has been an increase in the amount of matte produced in recent years. The production during 1913 amount-

ed to 91,694 tons of ore valued at £114,345, and 5,799 tons of matte valued at £150,152. This represents an increase in value of £13,288 for ore and £6,150 for matte as compared with 1912. The output of nickel during 1914 is stated to show an increase of 4 per cent. as compared with 1913.

For further details respecting the nickel deposits of New Caledonia, reference should be made to a report on these deposits by M. E. Glasser (Ann. des Mines, 1903, pp. 299 and 397).

### Nickel in Asia.

**India.**—Rocks of the norite type occur in some abundance in various parts of India, and pyrrhotite is abundant at some localities, as in Travancore. A sample of Travancore pyrrhotite examined at the Imperial Institute some years ago was found to contain some chalcopyrite and molybdenite. An analysis showed the presence of 0.63 per cent. of nickel oxide (NiO), 0.15 per cent. of cobalt oxide (CoO), and 0.39 per cent. of copper oxide (CuO). A small amount of gold and probably also a trace of platinum were present.

Nickeliferous pyrrhotite occurs also at various localities in Rajputana, as at Khetri, and in the Kolar gold reefs, associated with chalcopyrite.

## PROPOSED DEPARTMENT OF MINERALS AND METALS.

The following letter was addressed to Sir William S. McCormick, Chairman, Advisory Council for Scientific and Industrial Research, London: On behalf and by authority of the Councils of the following institutions: The Iron and Steel Institute (incorporated by Royal charter as representing the iron and steel industries); the Institute of Metals (incorporated as representing the users and manufacturers of non-ferrous metals and alloys); the Institution of Mining Engineers (incorporated by Royal charter as representing coal and iron ore mining and allied industries); and the Institution of Mining and Metallurgy (incorporated by Royal charter as representing the mining of minerals other than coal and iron ores and the production of metals other than iron and steel.

We, the undersigned, have the honor to submit the following considerations and recommendations in the hope that through the intervention of the Committee of the Privy Council for Scientific and Industrial Research, measures may be taken to provide the necessary machinery for the protection and advancement of the economic welfare of the mineral and metal industries of the Empire.

The absence of effective co-ordination of the organizations of these vital industries has been demonstrated and brought into prominence by the war, in many directions. The grave results to the national interests are generally admitted.

There are highly organized geological surveys and departments of mines in nearly all foreign countries, and their influence in the development of mineral resources is a factor of the first importance. There are similar well organized departments in some of the British Dominions, but there is no connecting link or central "clearing house" in the Metropolis of the Empire to co-ordinate information on its mineral resources, to stimulate their development and to safeguard Imperial interests.

Various departments of the Home Government, such as the Geological Surveys and Museum of Practical Geology, the Board of Trade, the Home Office, the Imperial Institute, and, since the outbreak of the present war, the Foreign Office, the Admiralty, the War Office and the Ministry of Munitions, have all been concerned with the collection of information bearing on the sources of supply of minerals and the production of metals. There does not appear, however, to have been any serious attempt to co-ordinate and render available even such information as has been collected by these departments, and it is certain that there has been considerable overlapping and duplication of effort with corresponding waste and confusion.

It is, we submit, obvious that the overlapping and confusion will be seriously increased if the various Technical Committees appointed by the Advisory Council attempt to collect the information which is essential to enable the beneficent object of the Committee of the Privy Council to be attained in its wider aspects, in regard to the mineral and metal industries.

We respectfully urge this view upon the serious attention of the Advisory Council, as already there are evidences of increasing overlapping and consequent waste of time and energy, which we believe it is one of the main purposes of the Committee of the Privy Council to eliminate as far as possible.

In the opinion of the institutions represented by us the organization of a central Department of Minerals and Metals is imperatively necessary in the public interest, and the work of organization, which will necessarily take much time to complete, should be commenced at the earliest possible moment.

It cannot be doubted that if a properly organized and efficiently conducted Department of Minerals and Metals had been in existence, much valuable time, many lives and vast sums of money would have been saved to the nation in the conduct of the present war, and much of the cost and inconvenience to British industries depending largely for their raw materials on mineral products would have been saved, with corresponding advantages to the prosecution of the war and to many industries.

A Department of Minerals and Metals should not only be in intimate relationship with the Geological Surveys and Mines Departments of the Dominions, but also with the organizations representing the different branches of the mining and metallurgical industries, whose co-operation in the work of the department should form a vital part of its machinery.

The Geological Surveys of Great Britain and Ireland and the Museum of Practical Geology should also form an integral part of the department.

The functions of the department should be active and constructive. All overlapping by other Home Government departments, and also by the institutions representing the industries, should be absolutely prevented.

The duties of a Department of Minerals and Metals would include:

1. Arrangements for expediting the completion of Mineral Surveys of the United Kingdom and of the Crown Colonies and other British possessions.

2. The systematic collection and co-ordination of information bearing on the occurrence, uses and economic value of minerals and their products; special attention being devoted to securing industrial applications for newly-discovered minerals or metallurgical products and to finding mineral materials required for new metallurgical products or inventions. Some of this information should be promptly and widely disseminated in summarized form to those interested in the industries, through the medium of the existing publications of the institutions directly concerned.

3. The investigation of all questions and problems relating to the utilization of the mineral or metallurgical resources of the Empire.

4. The co-ordination and dissemination of information on mining laws, development of mineral areas, output, processes of extraction, plant, capital employed, markets, etc., etc.

5. A general review from time to time of the developed and undeveloped mineral resources and of the position of each mineral or metal, to ensure that the mineral wealth of the Empire is being exploited with due regard to Imperial interests.

6. Generally, to advise the Imperial Government on all questions bearing on the mining and metallurgical industries. To perform this function efficiently, it is essential that complete information should be available, and also that the industries concerned should be consulted through their respective organizations.

We feel sure that the Advisory Council will fully appreciate the urgency of the question and the necessity for prompt action, so that the process of co-ordination may be inaugurated at once.

We are, sir, your obedient servants, Wm. Beardmore, G. C. Lloyd, George Beilby, G. Shaw Scott, W. Thorneycroft, L. T. O'Shea, P. Strzelecki, Edgar Taylor, C. McDermid.

## PERSONAL AND GENERAL

Mr. J. B. Tyrrell was at Herb lake, in The Pas mining district, last week.

Mr. E. L. Bruce, of the Geological Survey of Canada, is mapping the Herb lake district.

Dr. W. G. Miller, Provincial Geologist, and T. F. Sutherland, Chief Inspector of Mines, have returned to Toronto from Australia, after visiting the nickel deposits of New Caledonia and Tasmania.

Mr. Geo. T. Holloway, Mr. McGregor Young and Mr. T. W. Gibson have been holding sittings of the Nickel Commission at Sudbury, Porcupine and Cobalt.

Mr. Geo. Armstrong has resigned as manager of the Grafter mine, in Whitehorse copper camp, Southern Yukon, and has been succeeded by Mr. J. P. Whitney.

Mr. O. Lachmund, of Greenwood, Boundary district of British Columbia, late in September was a Coleman, Alberta, endeavoring to secure more coke for the company's smelting works.

Mr. F. J. Murphy, of Sandon, Slocan, B.C., assistant superintendent of the Surprise silver-lead-zinc mine and concentrating mill, was married on September 28 at New Denver, Slocan lake, to Miss Rubie LaNoir Rowland, of Kellogg, Coeur d'Alene district of Idaho.

Mr. Wm. Fleet Robertson, of Victoria, B.C., Provincial Mineralogist, visited the Consolidated Mining & Smelting Co.'s works at Trail late in September with Dr. Wm. Lorimer, the member of the Dominion Royal Commission, who gave especial attention to mining and mineral resources when in British Columbia. Mr. Robertson also went to the Boundary district.

The Western Branch of the Canadian Mining Institute will hold its twenty-third general meeting at Trail, British Columbia, on Thursday, October 26. It is proposed to next day visit Rossland.

Mr. Chas. M. Campbell, superintendent of the Granby Consolidated M., S. & P. Co.'s big copper mines near Phoenix, Boundary district of British Columbia, is on a trip through the eastern provinces of Canada. He left Phoenix on September 15th.

Mr. Barclay Bonthrone, of Vancouver, B. C., has been looking over a number of mineral claims situated in northeast Kootenay.

Mr. J. C. Murray, who now holds a commission with the Canadian Engineers as a tunneling officer, was in Toronto last week.

Mr. Miles Barrett, foreman at the Granby Consolidated Co.'s copper smeltery at Grand Forks, B. C., has gone to Chicago, Illinois, on a holiday trip. He left Grand Forks on September 14th.

Mr. F. H. Shepherd, M.P. for Nanaimo, Vancouver island, B. C., who several years ago was chief inspector of mines for British Columbia, has returned from Europe, where he was a member of a Parliamentary party that visited British and French soldiers behind the battle lines in France and Belgium.

Mr. Sidney Norman, editor of Northwest Mining Truth, published in Spokane, Washington, has been making a tour of the Slocan district of British Columbia, where he visited a number of operating mines and concentrating mills.

Mr. Joseph Lancaster, of Spokane, Washington, has been examining mineral claims in the Lardeau district, British Columbia.

Mr. James Cronin, of Spokane, Washington, after having had a busy summer and autumn season opening his silver-lead mine in the Babine section of Omineca mining division, British Columbia, is having supplies taken in from Hazelton by pack train, so that development work may be continued throughout the winter.

Hon. Lorne A. Campbell, of Rossland, B. C., Minister of Mines for British Columbia, failed to secure re-election at the recent Provincial election, so will shortly relinquish the portfolio of Mines in the Government of British Columbia, nearly all the other members of which were also defeated at the polls in September.

### COAST COPPER CO., BRITISH COLUMBIA.

The Coast Copper Co. is a company recently incorporated and gazetted in British Columbia, to acquire 31 mineral claims in Quatsino mining division, Vancouver island. The directors are stated to be Messrs. J. J. Warren, R. H. Stewart and S. G. Blaylock (respectively, managing director, general manager and assistant general manager of the Consolidated Mining & Smelting Co. of Canada, Ltd.), and Maurice W. Bacon and W. E. Cullen of Spokane, Washington.

The claims include what have long been known as the Merry Widow and Old Sport groups. In the British Columbia "Preliminary Review, 1915," reference was made to these properties, as follows: "Some further development has been done on the Merry Widow and Old Sport claims, where a large amount of very fair ore has been developed by diamond drilling. The property is some 20 miles from navigable water, and is consequently without much value until a railway can be constructed to salt water."

The mining recorder for Quatsino division reported for 1915: "The work done this year at the Old Sport mine, owned by the Quatsino Copper Co., Ltd., consisted of driving a 500 ft. tunnel, which cut through a 25 ft. lode of low grade copper ore at a depth of 135 ft. Stripping and crosscutting on the surface exposes the lode for more than 3,000 ft. The property shows up well under development, but, owing to some financial troubles, the company decided in August to suspend work."

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

Another dividend payment declaration has been made, namely, that of the Granby Consolidated Mining, Smelting and Power Co., which will pay on November 1st $2 a share, or a total for this profit distribution of $299,970. Other dividend payments this year were $1.50 a share in February, $1.50 a share in May, and $2 a share in August; in all $7 a share for the current calendar year. Dividends paid in 1915 totalled $3 a share; in 1914, $3; in 1913, $6; and in 1912, nil; so that the total for 1916 will be the highest in the five years just mentioned.

The shortage of labor at Crow's Nest collieries continues to adversely affect the smelting works of West Kootenay and Boundary districts. While the Granby Consolidated Co., which has a considerable holding in the Crow's Nest Pass Coal Co., has been getting more coke lately than about two months ago, and as a consequence has been able to increase the number of furnaces in blast at its works at Grand Forks to seven out of a total of eight, conditions have lately become less favorable at Trail, where the Consolidated M. and S. Co. had two of its copper furnaces idle during the third week of September. The British Columbia Copper Co. also finds its smelting operations restricted; it has only one furnace in blast.

### East Kootenay.

The resumption of mining at the Paradise mine, in Windermere division of East Kootenay, is a result of the construction and operation of the Kootenay Central railway from Golden on the main line of the Canadian Pacific Railway system southward up the valley of the Columbia river, and thence down the valley of the Kootenay river to the railway company's Crow's Nest railway. A newspaper correspondent writing from Invermere, on Windermere lake, through which the Columbia river passes, states that the first car of ore from the Paradise since work was resumed at the mine was shipped on September 5th. Eight heavy teams were hauling ore from the mine about 30 miles to the railway. Twenty-one men were employed at the mine and more were to be put on.

Mr. J. D. Galloway, Assistant Mineralogist, visited the property in the summer of 1915. He reported that the mine is situated near the head of Spring creek basin, at an elevation of from 8,400 to 8,800 ft., well above the timber-line. The mine camp, consisting of bunkhouses, cookhouse, office, storehouse, etc., is on level ground in the basin, and the mine-workings are on the sloping hillside to the north. Camp buildings were also erected at Pinehurst, about halfway between the mine and the Columbia, when ore was hauled in former years. During six years, 1901-1906, 1,996 tons of ore were shipped; metal contents were 2,368,972 lb. of lead and 102,784 oz. of silver, the average metallic content having been 51.4 oz. of silver to the ton and 59.3 per cent. lead.

### West Kootenay.

**Ainsworth**—Shipments of ore to Trail from mines in this division during three weeks ended September 21st totalled 925 tons. The mines and their shipment totals were as follows: Bluebell, 140 tons; Comfort, 76 tons; Highland, 523 tons; and Utica, 186 tons. The Bluebell was on the Trail list for the week ended September 21st for the first time in nine weeks, flood waters having caused damage to water-supply lines in the latter half of June, and a consequent suspension of mining and concentrating operations for about two months.

**Slocan**—Ore received at Trail from Slocan mines during three weeks ended September 21st was as follows: From Black Prince, 29 tons; Enterprise, 36 tons; Galena Farm, 119 tons; Hewitt, 43 tons; Idaho-Alamo, 41 tons; Lucky Thought, 82 tons; Rambler-Cariboo, 104 tons; Ruth, 56 tons; Slocan-Payne, 23 tons; Standard, 348 tons; Wonderful, 40 tons; total, 921 tons.

**Rossland**—Rossland mines shipped 16,410 tons of ore to Trail during three weeks ended September 21st, as follows: Centre Star group, 9,630 tons; Le Roi, 5,674 tons; Le Roi o.N 2 Co.'s Josie group, 1,106 tons. With the exception of 71 tons shipped some months ago, no other mine in Rossland camp than those mentioned above has been on the producing list.

**Nelson**—It has been reported from Salmo that the low-level adit being driven at the Hudson Bay mine, on Deer creek, has cut stringers of zinc sulphide ore at about 1,650 ft. in from its portal. Much zinc carbonate ore has been mined on the main level driven at a depth of 200 ft. below the outcrop of the ore, and in the 300-ft. level opened from the bottom of a winze sunk 100 ft. deep from the main level. Last year's shipments from the Hudson Bay and adjoining Zincton mines totalled 5,171 tons of ore, containing 3,127,209 lb. of zinc; this year also, much ore has been shipped, but figures showing the total quantity are not available. With the object of cutting the ore at greater depth, a commencement was made last spring to drive a crosscut adit at nearly 600 ft. below the 300-ft. level, and it was calculated that 1,750 ft. would have to be driven to get under the orebody being worked in the 300 and 200-ft. levels. Now, at about 100 ft. short of that distance, as already stated, stringers of zinc sulphide ore have been cut, which is regarded as a most favorable indication that the vein will be found ahead. If a strong body of zinc sulphide ore shall be opened at the depth the low-level tunnel is being driven, it will be one of the most important developments made in recent years in connection with mining in Nelson division.

### Omineca Division.

Information published at New Hazelton makes it appear that mining prospects are good in the Nine-Mile Mountain region of Omineca mining division. Several mining properties in Silver Cup basin have been examined lately for the purpose of ascertaining whether there is much ore in that neighborhood suitable for milling should a concentrating mill be established there. The properties examined were the Silver Bell, Silver Cup, Barber group, Sunrise, and others. The examining engineer was Mr. W. G. Norrie, superintendent of the Silver Standard mine, on Glen mountain. While his report had not been prepared when the account of his trip was made public, it was understood that he was well pleased with what he saw. The last official report of the district Gold Commissioner that has been published gives the following particulars: "From the Silver Cup group 70 tons of ore have been shipped to the smeltery, the predominating mineral being galena containing silver. Shipments from the Sunrise group have been about 74 tons of argentiferous galena. From the Barber group, 16 tons of ore taken from open-cuts at the surface has been sent to Trail. Ten tons of galena ore shipped from the Silver Bell assayed 110 oz. silver to the ton and 70 per cent. lead, with a little zinc. The American Boy property, owned by the Harris Brothers, of Hazelton, shipped to Trail

15 tons of ore which assayed gold 0.04 oz. and silver 98 oz. to the ton, lead 30 per cent., and zinc 14 per cent. There is on the dump about 600 tons of ore worth $35 a ton, and 3,000 tons of ore of a similar class developed in the mine and ready for stoping whenever capital shall be obtained to provide milling facilities. The Provincial Government wagon-road to the Nine-Mile basin, that has been in course of construction for several years, was completed last year, thereby facilitating the development of mining properties in the basin.

Owing to delay in completing the wagon-road to the Babine-Bonanza Mining and Milling Co.'s group of mineral claims, situated at the head of the Tuchi river in the Babine range of mountains, shipment of ore will not be undertaken as soon as had been intended. The mine is at an elevation of about 5,300 ft.; it is just over the divide from the head of Driftwood creek, and is distant about 22 miles by trail from Smithers on the Grand Trunk Pacific railway. The company is controlled by Mr. James Cronin, of Spokane, for many years largely interested in the St. Eugene lead-silver mine, in East Kootenay, which big mine made its greatest production during the period of Mr. Cronin's management. From an official report, by Mr. J. D. Galloway, Assistant Mineralogist, it is learned that the orebodies on the property of the Babine-Bonanza Co. occur at and near the contact of a granite porphyry with a series of highly altered sediments of the Hazelton group. Two types of orebodies are found, and the dominant minerals in them are galena and zinc-blende, together with lesser amounts of pyrite, arsenopyrite, and copper pyrites. The value is chiefly in silver and lead, although certain shoots of the ore contain a high percentage of zinc. Assay returns from samples taken by Mr. Galloway include one of ore from the bottom of a shaft then 105 ft. deep, an average of a 30-in. vein having been gold 0.02 oz., and silver 59.6 oz. to the ton, lead 54.6 per cent., and zinc 11.8 per cent. Since the visit of that official much more development work has been done, including an adit to cut the ore at greater depth. Mr. Cronin has been interested in this property ever since 1909, to which mining plant has been taken under considerable difficulties owing to lack of wagon-road communication, but it now seems as if transportation conditions will be greatly bettered by the time the winter shall set in.

### General Notes.

The Provincial Government Agent at Golden, in Northeast Kootenay, has received a request from Prof. T. L. Walker, of the Royal Ontario Museum of Mineralogy, for specimens representing the different types of ores from the chief mines and prospects in the district.

The establishment of smelting works at or near Prince Rupert, which is the western terminus of the Grand Trunk Pacific railway, is being advocated there and in the country about Hazelton, from which ore is being shipped, but delays take place in getting it conveyed to and treated at existing smelting works. Meanwhile the Tyee Copper Co.'s smeltery at Ladysmith, Vancouver island, is idle for lack of an assured regular supply of ore to warrant its being again operated.

A new discovery of copper ore is reported to have been made in the Nicola district, within seven miles of Merritt. Mr. Wm. Voght, who made the discovery, has recorded the location of the White Wing mineral claim; he states that preliminary surface work has shown the occurrence of bornite and copper carbonate ore.

A contract has been let for driving 200 ft. on the vein of the La Rose group, situated between seven and eight miles from the head of Alice arm of Observatory inlet, and six miles in on the Dolly Varden trail. The ore occurring here contains silver to the average value, it is stated, of about $100 to the ton. The Dolly Varden and Wolf groups of mineral claims, also in Skeena mining division, are under bond and option of purchase to Mr. R. B. McInnis, of San Francisco, California, while the Monarch group of four claims is under bond to Mr. T. F. Hopkins, of Seattle, Washington.

At the annual Inter-State fair, held at Spokane, Washington, early in September, awards were made in the mineral department for British Columbia mining exhibits, as follows: Of the British Columbia Copper, Consolidated Mining and Smelting, Florence, Granby Consolidated, and Standard Silver-Lead companies, and of several individual mines.

Certificates of competency in mine-rescue work were lately granted to eleven men employed at Nicola Valley collieries—four at the Middlesboro and seven at the Coal Hill colliery. Several weeks ago Mr. Dudley Michell, of the British Columbia Department of Mines, conducted an examination of Nicola Valley men who had taken the mine-rescue training course, and most of them succeeded in passing. At the end of 1915 there were in British Columbia 256 persons holding similar certificates of competency.

### GOLD AT BOURKES.

Cobalt, Oct. 7.—Some say all the romance has gone out of mining. At times that would seem to be true of Northern Ontario particularly, as its mining camps develop more or less into the same humdrum as an ordinary factory town. Occasionally there comes along an incident like the latest discovery at Bourkes that makes mining, particularly prospecting, as romantic as ever.

Oscar Anderson, a stalwart Norwegian, gradually made a clearing on his homestead butting onto the station grounds at Bourkes. During his clearing operations he uncovered some rock a short distance northwest of the station. Last week he decided to take a day off from farming work to prospect. He had only been looking around for a few minutes when he uncovered a vein. In the rotten stuff was some yellow metal. Oscar was not quite sure what it was, so started out with some to Albert Wickstead, the Postmaster, to get his advice. On his way to Albert's store he passed some men at the station, among them John J. Burns, who has been prospecting east of Bourkes. Oscar never got to the post office with the gold, for his farm was bought at the station by Burns. A half day's work with the pick brought him more return than all the work with the plow to date.

The discovery is one of the most spectacular in the north country. The vein is about four feet wide and has been stripped about forty feet. The Anderson find is the first west of the railway in that locality and quite a number of prospectors are in the field already. Their operations are handicapped because of the Anderson farm being surrounded on three sides by homesteads and on the south by railway land.—Northern Miner.

### BOSTON CREEK.

Development work on the Benny Hollinger claims at Boston creek is being carried on successfully. A shaft is being sunk on a quartz vein which shows some free gold.

## THE GROUND HOG DISTRICT.

Cyril Q. Young, manager of the eastern lands of the C. N. R., has issued an interesting article on the mining possibilities along their line from West Shining Tree to Nipigon from a traffic point of view. He says in part:

The continuance of the rich Porcupine belt unquestionably extends west across our line at Ground Hog river and Foleyet divisional point, and as far as our exploration goes continues west and quite probably is the same gold formation as outcrops at Hobon on the C. P. R. north of Michipicoten harbor.

The Ground Hog section in the vicinity of Flying Post gives some evidence of silver formation. Calcite occurs close to the contact of the diabase and Keewatin at the extreme end of the eastern arm of Lake Matagama, and the altered diabase carries some silver values on the eastern shore of the same arm of the lake. I am told that some conglomerate has been found on the point between Flying Post and the eastern arm of the aforesaid lake, but my men or myself did not meet it when cruising for land and timber, as we were seldom on this township.

Magnetic iron ore bodies occur at several points along the line of railway, the first of importance north of Ruel being 14 miles to the west of Stackpool at milage 105 at Sagatosh lake. Here Minneapolis and St. Paul capital has proved up millions of tons by diamond drilling within the past four years, the diamond drilling outfit having gone in from Bisco on the C. P. R. They are well satisfied with their results.

At Sagatosh lake 16 miles west of Stackpool, reached from Ground Hog (Kukatush), American interests have diamond drilled a strong lead-zinc vein to 500 ft. depth. They are seriously considering taking out ore and hauling it 14 miles to our rail, due to the continued advance in spelter these war times.

A few hundred men could not prospect the 600 miles of country adjacent to the line between Ruel and Port Arthur, even in a number of seasons, for in Temiskaming not only hundreds of thousands of dollars but millions of dollars were expended in prospecting and development on the 150 miles on the T. & N. O. railway between Cobalt and Cochrane. There are too many flying trips made, which do not remove any moss. Men are too content to stand with their paddles in their hands on the shore of the same routes and say there is nothing to it, but good prospectors and persistent mining men find camps with new tonnage after the "fly-by-night" staker departs.

Our trains will endeavor to accommodate groups of mining men who want to get off at river crossings instead of at the stations or crossing sidings, which could not always be placed at the river banks, due to engineering difficulties. A good through service exists from Toronto westward, trains leaving at 10.45 in the evening and reaching such points as Ground Hog river (Kukatush siding) at noon the next day.

The Ground Hog mining area can be better looked over from the river than elsewhere, and the stop will be made at the river instead of Kukatush siding, one and a-half miles east, if a mining party having tickets from southern points request the conductor in time to do so.

The mining recorder's office for the eastern section at Sudbury, for the section west of Missanabie river to Obakami siding, is at Sault Ste. Marie, and from Obakami, on west to Port Arthur, at Port Arthur.

## BRUNNER MOND CO.

Brunner Mond Canada, Ltd., Toronto, has been incorporated with a capital of $3,000,000. This company is empowered to recover and deal in soda, potash and chlorine and its compounds, and to engage in various works for the carrying on of its business, including the development of electric power, the surplus of which may be sold.

## IN SOUTH LORRAIN.

It is reported that good ore has been encountered at a depth of 285 ft. at the Belle Ellen mine in South Lorrain.

## MUNRO TOWNSHIP.

A quartz vein showing free gold has been uncovered on the Burton property, which lies west of the Croesus. This area was burned over in the big fire.

At Port Colborne the International Nickel Co. obtained options on 340 acres of land on the lake shore, and it was expected that ground would be broken at on early date for the erection of a $4,000,000 refining plant.

### TORONTO MARKETS.

Cobalt oxide, black, $1.05 per lb.
Cobalt oxide, grey, $1.15 per lb.
Cobalt metal, $1.25 to $1.50 per lb.
Cobalt anodes, $1.50 to $1.75 per lb.
Nickel metal, 45 to 50 cents per lb.
White arsenic, 5½ to 6 cents per lb.

Oct. 11—(Quotations from Canada Metal Co., Toronto)—
Spelter, 15 cents per lb.
Lead, 9 cents per lb.
Tin, 47 cents per lb.
Antimony, 18 cents per lb.
Copper, casting, 29 cents per lb.
Electrolytic, 31½ cents per lb.
Ingot brass, yellow, 17½ cents; red, 20½ cents per lb.

Oct. 11—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $8.50 per ton.
Coal, bituminous, $5.85 per ton.

### SILVER PRICES.

| September— | New York, cents. | London, pence. |
|---|---|---|
| 25th. | 69¼ | 32 15/16 |
| 26th. | 69¼ | 32 15/16 |
| 27th. | 69¼ | 32 15/16 |
| 28th. | 69⅛ | 32⅞ |
| 29th. | 69¼ | 32 15/16 |
| October— | | |
| 3rd. | 68⅞ | 32¾ |
| 4th. | 68⅜ | 32 3/16 |
| 5th. | 67½ | 32⅛ |

### MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% $MoS_2$, $13.00 per unit.
Ores carrying between 3% and 5% $MoS_2$, $14.50 per unit.
Ores carrying between 5% and 10% $MoS_2$, $16.00 per unit.
Ores carrying between 10% and 15% $MoS_2$, $17.00 per unit.
Ores carrying between 15% and 20% $MoS_2$, $18.00 per unit.
80% concentrates $1.00 lb. of $MoS_2$.
Penalties imposed for copper and bismuth.

# MARKETS

## NEW YORK MARKETS.

Oct. 11, 1916—Connellsville Coke—
Furnace, spot, $3.75 to $4.00
Contract, $3.25.
First half, $2.75.
Foundry, prompt, $3.75 to $4.00.
Contract, $3.50 to $3.75.

Oct. 11, 1916—Straits Tin, f.o.b., 39.87½ cents.

Copper—
Prime Lake, nominal, 28.25 to 28.50 cents.
Electrolytic, nominal, 28.50 to 28.75 cents.
Casting, nominal, 27.25 to 27.50 cents.

Lead, Trust price, 7.00 cents.

Lead, outside price, 7.00 to 7.12½ cents.

Spelter, prompt western shipment, nominal, 1$.17½ cts.

Antimony—
Chinese and Japanese, 11.25 to 11.50 cents.
American, nominal.

Aluminum—nominal—
No. 1 Virgin, 98-99 per cent., 62.00 to 63.00 cents.
Pure 98-99 per cent. remelt, 61.00 to 62.00 cents.
No. 12 alloy remelt, 47.00 to 49.00 cents.
Powdered aluminum, $1.00 to $1.15.

Metallic magnesium—99 per cent. plus, $3.50.

Nickel—Shot and ingot, $45.00.

Electrolytic, $50.00.

Cadmium, nominal, $1.45 to $1.50.

Quicksilver, $78.00.

Platinum, $90.00.

Cobalt (metallic), $1.25.

Silver (official), 67½ cents.

Metal Products—Following base prices represent the outside market except where otherwise specified and are entirely nominal except in the case of lead sheets and sheet zinc:

Sheet copper—
Hot rolled (f.o.b. mill), 37.50 cents.
cold rolled (f.o.b. mill), 38.50 cents.

Copper in rods, 43.00 cents.

Copper in rolls, 40.00 cents.

Copper wire (f.o.b. mill), 33.00 cents.

Copper wire (f.o.b. mill), Nov., 32.25 cents.

High brass—
Sheets, 42.00 to 46.00 cents.

Wire and light rods, 45.00 to 48.00 cents.

Heavy rods, 41.00 to 45.00 cents.

Tubing—
Brazed brass, 45.00 to 50.00 cents.
Brazed brass (f.o.b. mill), 43.75 cents.
Seamless copper, 47.00 to 49.00 cents.
Seamless brass (f.o.b. mill), 46.00 to 48.00 cents.

Naval bronze—
Rods (f.o.b. mill), 40.00 cents.
Sheets (f.o.b. mill), 41.50 cents.

Muntz metal—
Rods, 38.50 cents.
Rods (f.o.b. mill), 36.50 cents.
Sheets, 42.00 cents.
Sheets (f.o.b. mill), 40.00 cents.

Full lead sheets (f.o.b. mill), 8.50 cents.

Cut lead sheets (f.o.b. mill), 8.75 cents.

Sheet zinc (f.o.b. smelter), 15.00 cents.

## STOCK QUOTATIONS.

### New York Stocks.

| | Open. | Close. |
|---|---|---|
| Anaconda | 93.75 | 91.75 |
| Beth. Steel | 535.00 | .... |
| Chino | 53.62½ | .... |
| Dome | 24.62½ | .... |
| Granby | 90.00 | .... |
| Int. Nickel | 51.62½ | 50.25 |
| Miami | 37.75 | .... |
| Nevada Cons. | 21.62½ | 21.37½ |
| Ray Cons. | 24.50 | 25.00 |

### Porcupine Stocks.

As of Close Oct. 11, 1916.

| | Bid. | Asked. |
|---|---|---|
| Apex | .08¼ | .08 |
| Dome Extension | .34 | .33½ |
| Dome Lake | .62 | .61 |
| Dome Mines | .... | .24¾ |
| Dome Consolidated M. | .... | .09 |
| Foley | .81 | .70 |
| Gold Reef | .01¼ | .01 |
| Hollinger Con. | 6.99 | 6.95 |
| Homestake | .... | .61 |
| Jupiter | .27 | .26 |
| McIntyre | 1.40 | 1.39 |
| McIntyre Extension | .41½ | .43½ |
| Moneta | .17 | .16 |
| Pearl Lake | .00¼ | .... |
| Porcupine Crown | .69 | .67 |
| Porcupine Imperial | .04 | .03⅞ |
| Porcupine Bonanza | .15½ | .45 |
| Porcupine Tisdale | .02 | .01⅜ |
| Porcupine Vipond | .37½ | .36½ |
| Preston | .04½ | .04¼ |
| Schumacher | .... | .45 |
| Teck-Hughes | .40 | .37 |
| Newray | .69½ | .69 |
| West Dome Con. | .34 | .33¾ |
| Davidson | .49¾ | .49¼ |

### Cobalt Stocks.

| | | |
|---|---|---|
| Adanac | .... | .29 |
| Bailey | .07½ | .... |
| Beaver | .42½ | .42 |
| Chambers-Ferland | .20 | .17¼ |
| Coniagas | 5.10 | 4.90 |
| Crown Reserve | .53½ | .52½ |
| Foster | .07 | .... |
| Gifford | .... | .03⅞ |
| Gould Con. | .00½ | .... |
| Great Northern | .08 | .07½ |
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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 5
Armstrong, Whitworth of Can., Ltd. . . . . 10

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
Beatty, M. & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
Berger, C. L. & Sons . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd..... 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co..... 6
Canadian Explosives, Ltd..... 14
Can. Ingersoll-Rand Co., Ltd..... 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. ..... 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . .....Outside Back Cover

D

Dept. of Mines, Canada..... .....Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd..... 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fraser & Chalmers of Can. Ltd. 4
Fuller, A. S. & Co. . . . . 12

G

Gartshore, J. J. . . . . 12

H

Hassan, A. A, . . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11

I

Imperial Bank of Canada . . . . . 6
Industrial & Technical Press.... . . . . outside back cover
International Molybdenum Co....
International Nickel Co. . . . . 6

J

Jones & Glassco . . . . . 10
Johnson, Matthey & Co. . . . . 11

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

Mines Handbook . . . . . 2
Murphy, Chas. J. . . . . 11
Mussens, Ltd..... 10

N

Nova Scotia Steel & Coal Co..... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

O

Ontario, Province of . . . . . .....Inside Back Cover

P

Pacific Coast Pipe Co., Ltd. .... 9

Q

Quebec, Province of . . . . . 8

S

School of Mining . . . . . 5
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 11
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2

T

Tyrrell, J. B. . . . . 11

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Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

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Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

## GEOLOGICAL SURVEY

### Recent Publications

Summary Report of the Geological Survey for the Calendar Year 1915.

Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

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Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Map 59A. Wheaton, Yukon Territory.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

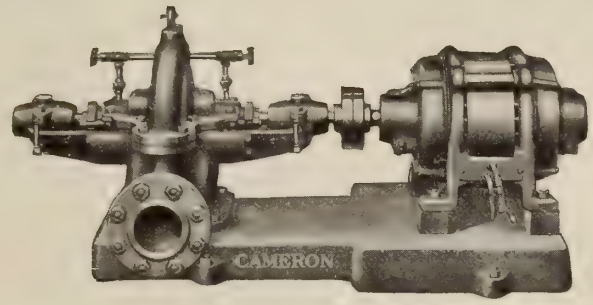
Map 160A. Manaimo Sheet, Vancouver Island.

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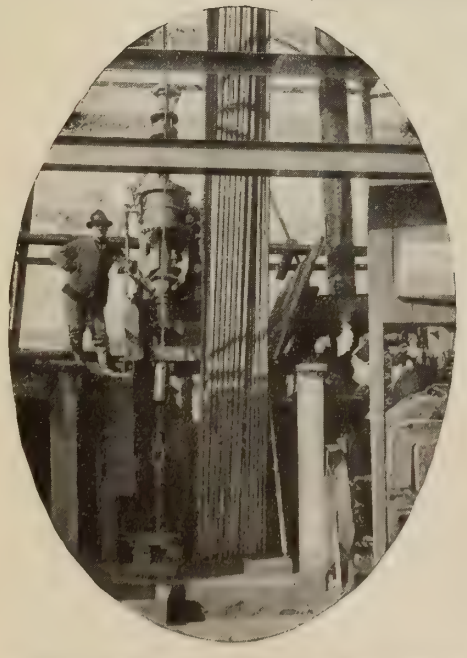
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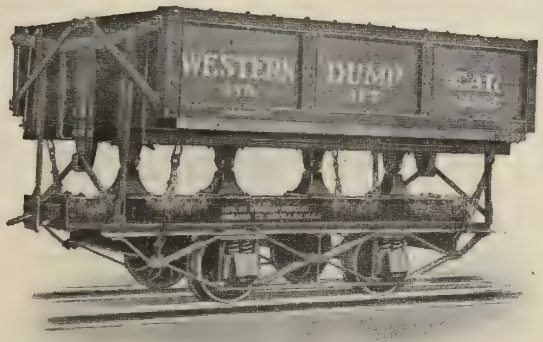
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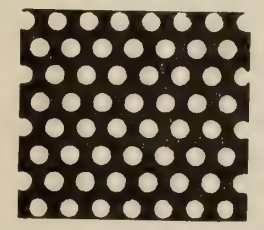
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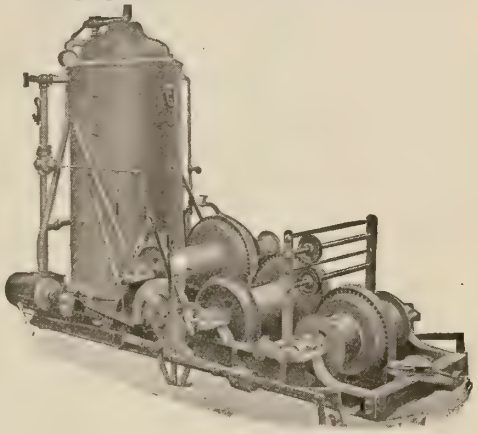
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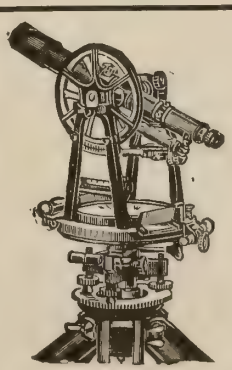
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, November 1, 1916. No. 21

## The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

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REGINALD E. HORE

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CONTENTS

| Editorials— | Page |
|---|---|
| Forest Fires | 503 |
| The Value of Nickel Matte | 504 |
| The Deutschland's Cargo | 504 |
| Methods and Costs of Placer Mining in the Yukon | 506 |
| The Profits of Coal Mining. By F. W. Gray | 510 |
| Mathematics and Engineering | 511 |
| Mining Possibilities along the Canadian Northern Railway | 515 |
| The Minerals Separation Case | 518 |
| Personal and General | 521 |
| Special Correspondence | 522 |
| Markets | 526 |

## FOREST FIRES

In an article published in "Queen's Quarterly," Dr. W. L. Goodwin makes some timely statements regarding forest fires. He says in part: "It is quite evident that if the laws were carefully administered, forest fires would be comparatively rare. Those who spend a good deal of time in the woods know that they are not carefully administered—hardly administered at all. My experience, while not confined to Ontario, has been mostly obtained in that province. It covers a considerable period of time and a large part of the province. My impression is that the people pay very little attention to the fire regulations. Settlers burn brush heaps at any time in the summer and often to my knowledge start fires to clear off land under circumstances which make it almost certain that the fires will spread. There seems to be no sense of responsibility, little thought of consequences, and a total disregard of the law, a copy of which carefully printed on linen may be conspicuously nailed up on a tree nearby. Lately I spent ten weeks in a district large areas of which have been burnt over so often that a clean sweep has been made of all vegetation and humus where the soil is thin, and even where it is deep, its fertility has been largely destroyed. During that time fires were very frequent, and to my knowledge most of them were set for two purposes, (1) by settlers to clear land, and (2) by persons who wanted an easier chance to prospect for minerals. For about a week two forest rangers were camped within sight of these fires. I saw them frequently, but never observed them take any measures to stop the fires. After smouldering for several weeks of calm weather the fire was at last brightened up by a gale which carried it for many miles. In its course it must have destroyed a good deal of valuable pine, scattered groves left from former fires, and it is certain that it set back the natural re-foresting of those rocky hills and ridges a generation or so. This case is only an example of many which I could cite, and which are within the knowledge of the general public. The newspaper discussion of the recent terrible devastation in Northern Ontario is significant. When it came to an inquiry into causes, the correspondents and editors almost invariably assigned the disaster to 'bush fires' which had been brought to large dimensions by drought and gales. It did not seem to occur to any of us wise people of Ontario to put the little fires out.

"The trouble is not with the laws, although I have no doubt they can be improved, but with their administration. To go deeper, there are a great many people living in Canada—in pessimistic moods I am inclined to include the vast majority of us—who are impatient of any restraint of their activity,—we are practically lawless in these respects. Our forefathers were not retricted in the matter of making fires anywhere and everywhere. But they knew how—were living under conditions which made it imperative that they should know how. A few dreadful experiences, like that of the Miramichi fire in New Brunswick three-quarters of a century ago, taught the pioneers of those days;

but their descendants, and the newcomers, many of them city dwellers, or children of city dwellers, do not see any reason for the precautions. It is true that a process of education is being attempted by the various government departments and bureaus. Carefully worded placards are posted everywhere in and near forest lands, asking the people to be careful in the use of fire and pointing out the possible consequences in destruction of property and life, if these precautions are not observed. The Canadian Forestry Association has taken up this propaganda energetically; and, by the way, the secretary, Mr. Robson Black, in a recent pamphlet, makes it quite clear that the Ontario law is defective both in its provisions and in its administration. These educative efforts are good, and have aroused a very large body of public opinion which now demands action. It can be safely assumed that intelligent, well informed Canadians are of one opinion as to the necessity for action, although it is rather disturbing to find journals like the Toronto Daily News and the Canadian Mining Journal taking comfort from the reflection that the recent fires in Northern Ontario will make prospecting easier! That is exactly the attitude of the prospector who starts a fire for the purpose! I do not think there are many real prospectors who would do it, but I know there are a few."

We agree with a great deal of what Dr. Goodwin has to say; but must protest aginst his statement that the "Canadian Mining Journal" has any such unnatural opinion concerning forest fires. Surely none who know of the sufferings caused by the disastrous fires which have visited our north country could hold such views as Dr. Goodwin gives us credit for. We believe that he has no justification for making such a statement.

It is a fact that forest fires sometimes assist the prospector. The fact, however, does not warrant Dr. Goodwin in assuming that we take comfort from the destruction of life and property. We cannot imagine why he should wish to give his readers such an impression of us. His statement is certainly not based on reliable information.

Dr. Goodwin has had excellent opportunities for observing conditons in our northern forests and his outspoken statements are worthy of the attention of those responsible for the enforcement of the laws.

In some respects our experience does not coincide with that of Dr. Goodwin. We have generally found that the Ontario prospector has learned by experience to dread forest fires and that his life in the forest has led him to appreciate the extent of the losses through fire. It is doubtless true that prospectors are to blame for some fires, but most of these men have a good deal of respect for the fire regulations. We venture to state that railway companies, settlers and tourists are more often to blame for fires than are prospectors.

Dr. Goodwin claims that "forest fires are usually started by people who are ignorant, careless or criminal." In which of these classes does he place the railway companies?

Dr. Goodwin says, in conclusion: "We Canadians should cultivate carefully a patriotism which includes the idea that our country with all its resources is a trust to be handed on to succeeding generations, not only unimpaired, but increased in value." This idea as applied to forests Dr. Goodwin will find to be well supported by northern prospectors. There are few greater admirers of our forest wealth than those who live in the woods.

## THE VALUE OF NICKEL MATTE

The Department of Customs in a report just issued states that during July, 1916, there was exported matte, ore and speiss containing 105,477 cwt. nickel valued at $1,193,604.

It may be safely assumed that practically all this nickel was from the smelters of the Sudbury district. The month's production of nickel when refined would be worth over $4,000,000.

The Department of Customs continues thus to publish figures which show that nickel in matte is worth only about one quarter of the value of refined nickel.

In previous issues we have raised the question as to whether certain figures published by our Government Departments are reliable. Official reports are worse than worthless if they are not accurate. They are not only a waste of the people's money, but they are dangerously misleading. We may, therefore, assume that the Department of Customs considers that nickel in matte is worth about 11.3 cents per pound. The question then arises as to whether or not the companies concerned also consider it a fair price.

If the companies consider that eleven cents a pound is a fair price, then the course for our Government is clear. We should at once make arrangements to take over all the matte on that basis and refine it ourselves. The Government would net a handsome profit in buying matte at eleven cents and selling the refined product at forty. In addition we would be satisfying the companies by giving them what they consider a fair price for their matte. The problem of control of nickel would also be simplified.

The above suggestion seems a reasonable one. We doubt, however, whether it could be satisfactorily followed out. We suspect that it would soon be found that the value placed on nickel matte by the Department of Customs is in need of adjustment.

## THE DEUTSCHLAND'S CARGO

In an interview given to the Associated Press, Lord Robert Cecil, Minister of War Trade, said: "When I tell you that the Deutschland took on board in America certain vitally necessary metals, of which there is a serious shortage in Germany for munition purposes, and that there is reason to believe that these particular metals were a part of the small stock mined in allied territory, you will see how important it is that we should take precautions to prevent allied property getting into the hands of those we know will use it to help our enemy."

It is well known that nickel was one of the "certain vitally necessary metals" taken to Germany by her adventurous merchant submarine. For some reason the origin of this nickel has not been made public. According to statements which have appeared in eastern papers it was known that certain firms were holding a supply of nickel for shipment from the United States to Germany at the first opportunity. That such was the case

is not very surprising. Failure to accumulate such a stock would be more likely to cause wonder.

Canadians were naturally much interested in that nickel shipment. We immediately wanted to know whether it was Canadian nickel. We were pleased to find that our Government officials were able to unhesitatingly state that it was not of Canadian origin.

In view of this fact considerable interest attaches to the following statistics, compiled by the United States Bureau of Commerce, showing the imports of nickel matte and ore during the fiscal year ended June 30th, 1916:

| From | Gross Tons. | Nickel Contents, Lbs. |
|---|---|---|
| France | 297 | 514,828 |
| Canada | 52,742 | 64,622,286 |
| Peru | 1 | 118 |
| Australia | 1,329 | 1,268,084 |
| French Oceania | 2,618 | 2,391,922 |

These comprise the entire nickel imports into the United States for the year named. It is not unlikely that the source of the Deutschland's nickel may be one of the countries named, though it is just as likely that the nickel shipped was refined in previous years.

Obviously Lord Robert Cecil was not referring to Canada when he said "the small stock mined." He was doubtless not referring to Australia when he used the term "allied territory." He certainly was not referring to Peru. The imports from France are doubtless not from ore mined in France. There remains only French Oceania, meaning New Caledonia.

If Lord Robert meant New Caledonia, might he not better have said so? If he did not, should he have given out a statement which can in the light of known facts be variously interpreted? By at least some Canadians the practice of casting a cloak of mystery about facts is not highly appreciated.

Why is such an endeavor made to conceal the truth? Why do statesmen speak in whispers about such matters as nickel exports? It is surely not because they do not know of the ill effects. They certainly are aware that such statements as those of Sir Robert lead to unjust suspicion being cast on producers of metals. Why should the producer be made to appear in such an unfavorable light? Surely it has been abundantly shown that the producer of metals is one of the most useful persons at the present time.

The statement given out by Sir Robert led those who were more or less familiar with the facts to suspect that he was referring to some country other than Canada. Many Canadians, however, accepted his words as proof that Canadian nickel was carried to Germany on the Deutschland. Newspapers spread this idea broadcast and commented on what they considered new proof of the much talked of German control of our nickel industry.

## HAILEYBURY SCHOOL OF MINES.

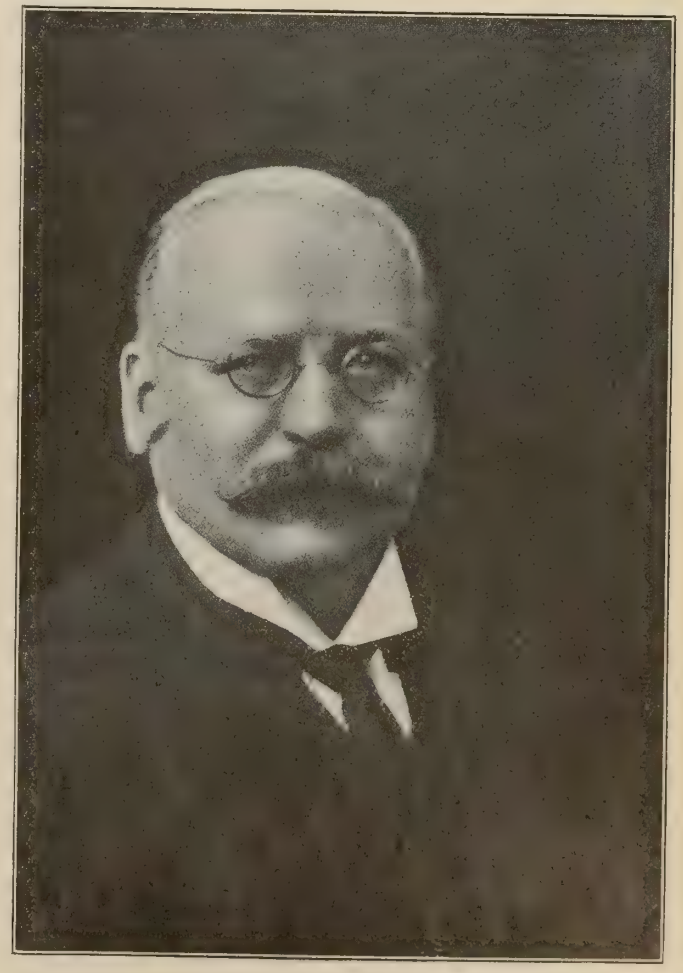
The new mining and milling laboratory of the Haileybury School of Mines, Ont., is nearing completion, and the school is now receiving machinery and equipment. The laboratory will comprise a complete small size concentrator, cyanide mill, flotation plant, assay office, blacksmith shop, machine shop and carpenter shop, and will contain most of the machines usually met with in these lines. The school has the co-operation of the mines of the Cobalt district, and of manufacturers of mining machinery, and is always pleased to make arrangements with manufacturers who wish to have their machinery represented in the school.

## BRITISH-AMERICA NICKEL.

The coming to Toronto of Mr. E. P. Mathewson to take up his new work as general manger of the British-America Nickel Corporation, is an important step forward to the time when this company will begin active operations in the Sudbury district. Mr. W. A. Carlyle, the prominent metallurgist who represents the British Government, has been in Canada for some time. These two gentlemen should be able to give President Dunn the best of technical advice.

## BEDFORD McNEILL.

Canadian mining men who knew Mr. Bedford McNeill remember him as an unusually likeable man. Together with his charming wife, Mr. McNeill visited Canadian mining districts in 1913 on the occasion of the International Geological Congress. They made many friends here who deeply regret his loss.



**The late Bedford McNeill**

Mr. McNeill was in 1913 president of the Institution of Mining and Metallurgy. He had a wide experience in mining in Europe and America. His name is exceptionally well known all over the world on account of his cable codes.

# METHODS AND COSTS OF PLACER MINING IN YUKON*

Prospecting.—The first work the prospector does on a new creek is to pan wherever the bedrock is exposed by the action of water. (Bonanza creek was accidentally discovered by Carmack, who panned in this way, and staked without further prospecting.) If, after panning, favorable prospects are found, a small space of ground is cleared and a shaft, usually 3 feet by 5 feet, is sunk to bedrock.

It is not necessary to thaw the frozen muck, which can be broken with a pick, but when the gravel is reached it is necessary to make a fire on the bottom of the shaft and thaw downwards until bedrock is reached. Another method of thawing the gravel is by boulders which have been heated in a fire. The warm boulders are dropped on the bottom of the shaft and covered with moss or bush. Either process thaws from one to two feet of gravel in about five or six hours. Dirt can be thrown out of the shaft to a depth of about ten feet, and then it is necessary to use a windlass to hoist. The gravel removed from the shaft is also panned at frequent intervals. The general rule is that if there is pay at all in the gravels, it is richest on or in bedrock. Paradise Hill, on Hunker creek, however, has furnished an exception to this rule. The main gold zone here in many places is found not in bedrock, but at elevations of from three to twelve feet or more above it.

To drift or tunnel, a fire is built against the side of the shaft, and the necessary amount of gravel is excavated. To prospect on creeks where a small boiler can be used, the procedure is somewhat different. A small Porcupine boiler of 3 h.p., which furnishes steam to three points is generally utilized. A half-inch pipe can be driven through 10 feet of muck in about five hours. To sink a shaft of 20 feet in this way requires about one cord of wood for thawing, and two men will remove the dirt from the shaft in two days.

Thawing.—The gold-bearing gravels in the Klondike are perpetually frozen and have to be thawed by one of the various methods employed in the district. Even if mechanical appliances were devised to excavate these gravels in a frozen condition, a process of thawing would be necessary before the gold could be recovered. The efficiency of any one method of thawing varies with the quantity of humidity in and the compactness of the gravels. Nearly all the gold-bearing streams of Post Tertiary age are frozen to bedrock and artificial thawing is absolutely necessary, while those of most recent age are only partially frozen and do not require artificial thawing.

Natural Thawing.—The method of exposing the gravels to the sun to thaw has not been universally adopted, partly because the overburden cannot be removed on account of the lack of water and grade and partly on account of the short seasons. It has not yet been demonstrated whether it is possible, either from a physical or economic point of view, to thaw a creek gravel deposit of 15 feet in depth. The surface of all creek bed deposits is covered with moss overlying a layer of frozen soil—known as "muck"—from a few feet to 14 feet in thickness. Before the rays of the sun can effectually penetrate the muck, the moss has to be removed by artificial means. If the grade is available the muck is removed by ground-sluicing. Where the body of gravel is exposed the sun will thaw from four to five feet in one season, but where this depth is exceeded, it is necessary to thaw by artificial means where dredges are operating. In open-cut work, where the material is excavated with the pick and shovel, the sun's rays are sufficient to thaw for a number of shovelers according to the area of gravels exposed. In all hydraulic operations the heat of the sun is the only medium of thawing. The monitor is placed in such a position that it can be directed alternately on certain areas, the face of the gravels usually being worked in three sections, i.e., while the water is directed on one section the other two sections are thawing. In this way the sun will supply sufficient material to keep the monitor operating.

Thawing with Rocks.—The method of thawing with rocks is not now practised. During the period of early mining in the Fortymile district, rocks were heated in a fire on the surface of the ground, and then dropped on the bottom of the shaft, where they were covered with tin or sheet iron to concentrate the heat. Rocks were also used to thaw the ground for drifting. Thawing with rocks concentrates the heat, and obviates the sloughing of the side of a shaft. In many localities the muck contains streaks of sand through which the heat is more rapidly conducted, and as a result a portion of the roof may fall down or "cave-in," as it is usually termed.

Thawing with Wood.—The several species of wood available for thawing purposes are, spruce, cotton-wood and jack-pine, the latter kind being scarce, the former species are chiefly used.

Thawing Bar Diggings.—The method employed in thawing bar diggings in the Fortymile district was as follows, namely:—

An area of about 50 feet square was stripped of ice, and a portion of this area, 20 feet in length by 6 feet in width was thawed by one fire, this being the quantity one man could excavate before the thawed ground was again affected by the frost. A row of kindling, two feet in width was placed along the whole length of the twenty feet, and covered with dry spruce. A second and third row of wood was placed on top and sheet iron or tin was used as a complete cover, so that the wood could smoulder and the heat be retained or concentrated within the area to be thawed. The quantity of wood necessary to thaw an area of ground 20 feet long by 6 feet wide and 1½ feet deep, was estimated at 1½ cords.

Wood Thawing in Drifts.—The method of thawing with wood in drifting operations is practically the same as that employed in bar diggings, but more care is exercised in placing the fires. This method is employed only in small drifting operations, when the material is hoisted with a windlass. To expedite the work in the drifts, it is customary to sink two shafts from 50 to 75 feet apart. While the drift from one shaft is being thawed, the dirt from the other shaft is hoisted from the other shaft. The mode of placing the wood along the face of the drift is as follows: Kindlings about one foot in width are placed along the face of the drift, and then a layer of wood. Dry spruce is placed on top of the kindlings for a width of a foot on each side. On top of the dry spruce is placed a layer of green spruce, which in turn is covered by sheet iron. The spruce and sheet iron keeps the fire smouldering and concentrate the heat. When bedrock is thawed the same method is applied, but the wood is placed lengthwise along the drift, the end of one stick resting on the end of the other. Fires of this kind burn for three or five hours.

* Extract from a report on the Yukon Territory published by direction of the Minister of the Interior, Ottawa, 1916.

Thawing with Hot Water.—This method is employed to the best advantage when the gravels are compact and contain very little sediment. Where the gravels are thawed by this method a much greater quantity of dirt can be handled by the shovellers than when the ground is thawed by either wood or steam. The method may be described as follows: A sump-hole is made at the bottom of the shaft, about five or six feet below the level of the drift, and a pulsometer or a duplex Worthington pump is installed on top of the sump-hole. The steam from the boilers is conducted through an iron pipe, down the shaft, to the pump or pulsometer, as the case may be. At the bottom of the shaft there is a small pressure pump, to which is attached a fire hose with nozzle. The water from the sump-hole is pumped on the face of the drift, and returns to the sump-hole by means of a small ditch dug along the side of the drift. The same water is used several times, and when it accumulates, as a result of the humidity of the gravels, it is pumped out of the shaft. The water is kept warm either by the fresh steam from the boilers or the exhaust from the pump or both. The duty of a No. 7 pulsometer is about 60 cubic yards in ten hours.

Thawing with Steam Points.—Steam thawing is employed in three distinct kinds of operations, drifting, open-cutting and dredging.

A " point " is made of extra hydraulic pipe, is 6 feet in length and has a bore of 1½ inches to ⅜ of an inch in diameter. They have solid standard heads, which stand the blow of a six or eight pound hammer.

The points are connected with batteries of four each, having a separate steam hose — usually ½-inch — and steam valve, and each battery is connected with the main steam line ¾-inch steam hose and valve.

To do efficient work each point requires steam equal to 1½ h.p., boiler capacity, i.e., a 30 h.p. boiler will furnish steam to 20 points. If a smaller boiler is used for this number of points, much trouble will be experienced in firing and supplying the boiler with water.

The quantity of ground that can be thawed with a steam point varies from 3 to 6 and often 7 cubic yards in 10 hours. The efficiency of the point varies according to the compactness of the gravels, the quantity of humidity in the gravels and the area to be thawed and as to whether it is in a drift or ahead of a dredge. In drifting operations the average duty of the point is 3.75 cubic yards in 10 hours.

When points are set in the face of a drift they are first driven about two feet, and allowed to remain at this length for an hour or so. They are then driven other two feet, and finally driven the full length. The points are set about three feet apart in average gravels, but only two and a half feet in compact gravels. Care has to be taken that only the pay material is thawed, otherwise waste material will have to be removed.

Thawing Ahead of Dredge.—All the dredges operating in frozen ground have steam plants for the purpose of thawing the gravels ahead of the dredge. The size of the plant depends on the number and capacity of the dredges in operation. The boilers used in operations of this kind are from 100 to 150 h.p. The steam is transmitted from the main station across the area to be thawed, by means of a main steam pipe from which there are many laterals conducting steam to batteries of 4, 6 and 8 points. All the main steam pipes are inclosed in a wooden box to avoid the condensation of the steam. The points are set from 4 to 6 feet apart and are from 12 to 15 feet in length, and are left in place for eight hours. The duty of a point under these conditions is from 5 to 7 cubic yards in ten hours.

Ground Sluicing.—This method consists of concentrating the steam on the gravels, which are thus removed by water without pressure. To successfully operate by this method it is necessary (1) to have a plentiful supply of water, (2) to operate in shallow gravels, and (3) to have a stream of sufficient grade to move the material. When the whole material from surface to bedrock is removed in this manner, the method is known as " ground-sluicing "; when only the over-burden is removed the method is known as " stripping." This work is easily done in the early spring by taking advantage of the spring floods and leading the water by several channels across the claim. The muck thaws easily and the streams soon cut down to the gravel, and then gradually widen their channels until they meet. In some cases the process is hastened by blasting out the walls of the muck channel with slow explosives. The upper portion, if barren, is removed and piled up where most convenient, and the underlying pay gravels are shoveled up or hoisted in buckets, and sluiced in the ordinary way.

Sluicing.—An abundant supply of water is essential to successful placer mining. After a winter dump has been thawed by steam points the dirt is moved to the sluice-boxes in various ways. One method is to scrape the dirt into a dump box at the head of the line of sluice-boxes. This is usually done by a steam scraper. Another method is to pump the water to sufficient elevation, so as to give a pressure to hydraulic the dirt from the dump into the sluice-boxes. When the water is convenient, however, probably the most economical mode of sluicing a dump is to place two sluice-boxes parallel to each other, on the space of ground where the dirt is to be dumped. These boxes are covered by short wooden planks or some other sufficient covering to keep clear the space through which the water runs in the process of sluicing. In the spring the sluice-boxes are gradually uncovered from one end, and the work of shoveling in, i.e., depositing the dirt in the sluice-boxes, can be accomplished by two or three men. This method obviates the necessity of employing a large number of shovelers. In order to confine the dirt within a limited area, cribbing is constructed around the dump so that the dirt is retained within easy access of the sluice-boxes. On many of the claims, however, the water for sluicing purposes, instead of being conveyed by flume from a point at a sufficient distance up the creek to give the required grade, is pumped up, and the sluice-boxes are placed high enough to carry the tailings where required, thus obviating the expense of handling or scraping tailings. During the summer the dirt or pay gravel is carried directly from the shaft and dumped into the sluice-boxes from the bucket attached to the self-dumper. By the open-cut method in shallow ground, however, the pay gravel is sometimes conveyed to the sluice-boxes by the ordinary wheelbarrow.

Self-Dumper.—The self-dumper or carrier was designed specially for the Yukon, and to meet the requirements of the miners for some light and simple machine that would hoist and convey the dirt from the bottom of the shaft or from an open-cut, to the dump or slice-box. The carrier is operated on a single three-quarter inch cable stretched between two posts, and usually at an angle of about forty degrees, but if necessary at a much less grade. One post, about five feet high, is situated in rear of the shaft, and the other post, which is called the " gin-pole," is erected at whatever point the dirt is to be dumped. The carrier itself is worked by a single three-eighth inch or one-half inch

cable. The hoisting cable extends from the drum of the engine to the top of the gin-pole where it passes through a block and extends to the carrier, which, for example, is at the top of the shaft. The cable passes through a sheave in the carrier and extends down the shaft, passing through a block attached to the bale or handle of the bucket and then returning to the carrier, where it is fastened. When the signal to hoist is given the cable winds around the drum of the hoisting engine, quickly lifting the bucket from the bottom of the shaft to the carrier, where the handle of the block, which is attached to the bucket bale, lifts the hook in the centre of the carrier, thereby releasing the sliding latch and automatically locking the hook and holding the bucket securely in the centre of the carrier. This occupies only the fraction of a second, and the travel of the carrier is not impeded. The dumper is then pulled along the carrying cable to the point where the dirt is to be dumped. A chain is attached to the front side of the bucket, and at the end of the chain is a ring, which passes along a cable fastened at both ends and lying upon the ground directly under the carrying cable. When this ring comes in contact with a clamp, which is fastened to the cable, the bucket is prevented from going any farther and the strain on the chain overturns the bucket and the contents are emptied on the dump. After dumping, the hoising cable is slackened and the dumper or carrier rapidly travels down the cable until it reaches the top of the shaft. An eccentric hook attached to the sliding latch in the carrier strikes a ball fastened on the carrying cable. This action releases the sliding latch, unlocks the hook, and disconnects the handle of the bucket from the carrier. The bucket then travels down the shaft to be re-filled.

### Costs.

Cost of complete pumping, thawing and self-dumping outfit suitable for working ten shovels (or 16 shovels if power is not required to pump).

| | |
|---|---|
| 40 h.p. Scotch Marine Water Back Boiler, return flue | $1,300.00 |
| 15 h.p. horizontal engine | 375.00 |
| 6 h.p. Gould centrifugal pump (with foot valve attached) | 300.00 |
| 10 h.p. hoisting engine | 450.00 |
| Self-dumping carrier and turnbuckle | 100.00 |
| 200 feet ¾-inch cable | 38.00 |
| 500 feet ⅝-inch cable | 50.00 |
| 20 ½-inch thawing points, 8 feet long* | 200.00 |
| 4 wheelbarrow bucket | 60.00 |
| 10 Pan-American wheelbarrows | 100.00 |
| 100 feet ⅝-inch *steam hose* | 65.00 |
| 1 dozen Silver Dollar shovels | 18.00 |
| 200 feet ¾inch pipe | 24.00 |
| Miscellaneous tools and fittings | 125.00 |
| | $3,205.00 |

* To thaw by hot water instead of steam the points would be substituted by a pump at an approximately similar cost.

The self-dumping carrier can be used with a much smaller plant, and is in general use where only five or six shovelers are employed. In a smaller plant the cost of boiler, engine and hoist is much less than the figures quoted.

The following two tables, showing the cost of sinking shafts, were furnished by two different operators on the watershed of Indian river, namely:—

Sinking by Self-Dumper.
(30 ft. deep, and 8 by 8 ft.)

| | |
|---|---|
| 1 boilerman* (one shift) | $6.50 |
| 1 pointman* (one shift) | 7.00 |
| 1 hoistman* (one shift) | 7.00 |
| 2 shovellers* at $6.50 (one shift) | 13.00 |
| ½ cord wood (fuel) (one shift) | 4.00 |
| 3⅓ cords (timbering) at $8 (one shift) | 26.66 |
| | $64.16 |
| 7 ft. thawed and hoisted in 12 hours. | |
| Cost of 7 ft. (including timbering) | $64.16 |
| Cost per ft. | 9.16 |

* These figures include an allowance of $2.00 per day per man for board, i.e., 1 boilerman at $4.50 plus $2.00.

In this case the shaft was 55 feet deep and 8 by 8 feet, and the dirt was hoisted by hand windlass.

| | |
|---|---|
| Labor | $400.00 |
| Timbering, 6 cords at $8 | 48.00 |
| Dressing timber | 50.00 |
| Steam for thawing, at $1 an hour, 50 hours | 50.00 |
| Cost of 55 ft. | *$548.00 |
| Cost per ft. | $9.96 |

* The cost of sinking this shaft was furnished by one of the most successful operators on the watershed of Indian river, and is based on the prices of the present day, the shaft having been sunk in June, 1909.

Tunnelling by Self-Dumper.
(6 ft. by 6 ft.)

| | |
|---|---|
| 7 to 12 p.m.—1 pumpman | *$7.00 |
| 1 helper | * 6.00 |
| 1 fireman | * 6.50 |
| 1 to 6 a.m.—1 engineer | 7.50 |
| 6 shovellers at $6.50 | 39.00 |
| Wood consumed, ¾ cords | 6.00 |
| Timbering 12 ft. of tunnel, ⅔ cords | 5.33 |
| | †$77.33 |
| 6 feet of dirt excavated on each side of shaft in 12 hours. | |
| Cost of 12 ft. | $77.33 |
| Cost per ft. | 6.44 |

* Thaws 5 hours.
† These figures include an allowance at the rate of $2.00 per day per man for board.

The six shovelers take out the dirt and timber the portion of the tunnel that has been excavated. If the roof is muck, it is not necessary to timber. When the roof is gravel, the tunnel is timbered to obviate the sloughing of rocks and dirt, which would impede the progress of the work along the tunnel. It is claimed that the best method is to thaw five hours for the reason that the water becomes warm when thawing for ten hours, and as a result the roof is more liable to slough, the dirt piles up and blocks the operations of the nozzleman and the shovelers work at a disadvantage.

The following table, which was furnished by one of the most successful operators on the Indian river watershed, is taken from a 42 days' run, and shows the working cost per square foot of bedrock, i.e., the actual cost of thawing, hoisting and sluicing, the dirt being dumped from the bucket into the sluice-boxes:

| | |
|---|---|
| Thawing Crew— | |
| 2 pumpmen at $6.00 | $12.00 |
| 2 helpers at $5.00 | 10.00 |
| 1 fireman at $5.00 | 5.00 |
| 3 cords wood at $8.00 per cord | 24.00 |

| | |
|---|---|
| Hoisting Crew— | |
| 1 foreman at $6.00 | 6.00 |
| 1 engineer at $6.00 | 6.00 |
| 1 dumpman at $5.00 | 5.00 |
| 1 bucketman at $5.00 | 5.00 |
| 12 shovellers at $5.00 | 60.00 |
| Wheeling planks at $75.00 per M. | 10.00 |
| *21 days' board at $1.75 | 36.75 |
| | †$179.75 |

* In this case the board of 21 men is reckoned at $1.75 each.
† It will be noted that the wages paid by this operator is above the average, and it necessarily follows that only the best men are employed.

The quantity of material handled per day of 10 hours was 590 sq. ft. of bedrock, the dirt hoisted being approximately three feet deep.

| | |
|---|---|
| Cost of handling 590 sq. ft. of bedrock | $179.75 |
| Cost per sq. ft. of bedrock | .30 |

The following table, which was furnished by a skilful operator, shows the working cost of a self-dumping plant, namely:—

Working Cost of Self-Dumper.

| | |
|---|---|
| Thawing Crew— | |
| *2 pumpmen at $7.00 per day | $14.00 |
| *1 helper at $6.00 per day | 6.00 |
| *1 fireman at $6.50 per day | 6.50 |
| Hoisting Crew— | |
| *1 foreman at $8.00 per day | 8.00 |
| *1 engineer at $7.50 per day | 7.50 |
| *1 dumpman at $6.50 per day | 6.50 |
| *1 bucketman at $6.50 per day | 6.50 |
| *16 shovellers at $6.50 per day | 104.00 |
| 3 cords of wood at $8.00 | 24.00 |
| Box candles | 3.50 |
| Coal, 25c; oil, 25c | .50 |
| Picks (life one month), 16 at $2.50; shovels (life one month), 16 at $18.00 per doz. (per day). | 2.13 |
| Wheeling planks (life three months), at $75.00 per M. per day | 25 |
| | $189.38 |

* These figures include an allowance of $2.00 per day per man for board.

The capacity of the above plant, equipped with two No. 6 pulsometers, would be approximately 600 sq. ft. of bedrock, the dirt hoisted being between 3 and 4 feet deep.

| | |
|---|---|
| 600 sq. ft. of bedrock | $189.38 |
| Cost per sq. ft. of bedrock | †.31 |

† The above table includes the cost of thawing, hoisting and sluicing.

Hoisting by Windlass.—The following information, which was furnished by a miner on Lower Dominion, will give an idea of the cost of hoisting the dirt by hand windlass: (On many claims on the lower portion of Dominion the pay gravel is thawed by fires of kindling wood, and described under paragraph 7 of this part, and the dirt is hoisted by hand windlass.)

Plant.

1 5-h.p. boiler.
40 ft. ½-inch steam pipe.
2 steam points with hose.
1 lead hose, 10 ft. (to connect point battery with steam pipe).
1 windlass with 40 ft. ¾-inch rope or ¼-inch cable.
2 windlass buckets.
Picks and shovels.

The ground is thawed for five hours in the afternoon and allowed to cool over night. The thawed dirt is then hoisted in five hours next morning. Two men thaw and take out six feet of dirt in one shift, i.e., ten hours. Approximately one cord of wood is sufficient fuel to thaw a shaft 30 feet deep.

Working Costs.
(Sinking shaft 3 ft. by 5 ft.)

| | |
|---|---|
| 2 men at $6.50 | $13.00 |
| Wood, for thawing | 2.00 |
| | $15.00 |
| Cost of sinking 6 ft. | $15.00 |
| Cost per ft. | 2.50 |

Tunneling.—From the bottom of the shaft two men will drive a tunnel 6 feet by 4 feet by 3½ feet, in one shift, i.e., thaw the ground and hoist the dirt in ten hours. (It is seldom necessary to timber shafts or tunnels for windlass work.) The cost of tunneling by this method is estimated as follows:—

| | |
|---|---|
| 2 men at $6.50 | $13.00 |
| Wood for thawing | 2.00 |
| | $15.00 |
| Cost of tunnelling 6 ft. | $15.00 |
| Cost per ft. | *2.50 |

* The shaft in this case was 30 ft. in depth. The cost per ft. would necessarily increase according to the distance from the bottom of the shaft.

## THE CREIGHTON NICKEL-COPPER DEPOSIT.

According to Mr. Cyril W. Knight, in a letter published in the "Engineering and Mining Journal," the Creighton orebody is an enormous breccia of crushed rocks. Mr. Knight says:

"The oldest rocks in the immediate vicinity of the Creighton are greenstones. Norite was intruded into these greenstones. Then came the granite intrusion, which formed the foot wall of the orebody. The granite forced its way mainly along the norite-greenstone contact. After the granite had solidified, there followed a period of tremendous crushing and brecciation along the norite-granite contact, and great 'crush breccias' and 'crush conglomerates' were formed. The fragments of this brecciated material vary in size from immense blocks 100 feet long to microscopic specks—rocks ground to powder. The shape of the fragments and blocks is infinite in variety, varying from sharply angular to round. Solutions circulated through the 'crush breccia' and 'crush conglomerate,' depositing sulphides that cemented the fragments together and partly or almost wholly replaced them. Some replacement of the granite foot wall also took place, but the norite hanging wall, particularly where it has been slightly sheared and brecciated, was more severely attacked, often forming what has been called 'spotted' norite. In short, the immense stopes of the Creighton mine have demonstrated that the orebody is merely an enormous 'breccia' or 'conglomerate' of crushed rocks, granite, greenstone and norite, cemented together by sulphides. The contact between this orebody and the lean, non-commercial hanging wall of 'spotted' norite is comparatively sharp—a few feet more or less. The 'spotted' norite, on the other hand, becomes gradually less and less impregnated and replaced with sulphides as the distance from the orebody increases. It may be added that every other commercial orebody in the nickel field is mainly of this character; that is, a mass of crushed rock fragments cemented together by sulphides."

# THE PROFITS OF COAL MINING

By F. W. Gray.

Mr. Blake Walker, one of the best known colliery owners and mining engineers of Great Britain, was recently presented by his workpeople with a portrait of himself as an appreciation of 42 years as the head of the Wharncliffe Silkstone Collieries, in South Yorkshire. Mr. Walker is an example, all too few alas in these days of corporations, of an employer whose relations with his workmen have been very intimate, and in whose mind the well-being of his employees has always taken first place.

Some of the remarks made by Mr. Walker in his speech on this occasion are worthy of note.

Mr. Walker mentioned that Wharncliffe Silkstone Colliery — which may be taken as typical of many other collieries — had been working sixty years. In that time there had been disbursed in wages some $27,500,000, and approximately 5,000 people had been kept in comfort by this disbursement over a long period of years. The above mentioned sum represented 89¼ per cent. of the total amount disbursed in wages, royalties and profits. The royalty payments had been 8½ per cent. of the total, and the return to the shareholders 2¼ per cent. The speaker said he wondered how many people realised that this was the financial return on a colliery that had mined coal for sixty years, and added that he thought if the figures were available from other collieries in South Yorkshire the results would not be greatly different.

Some years ago Lord Joicey, an eminent North Country coal-owner, said that the net return to the capitalist on coal-mining investments over a long term of years would not exceed five per cent. interest on the investment, without any return of principal.

Much the same statement could be made with reference to coal-mining investments in Canada. It is hardly expected that the capital invested in a colliery should ever be returned, and it would be hard to discover a Canadian coal company which to-day could return the capital invested in its properties. It would also be hard to find a coal company in Canada that had paid a continuous divided of five per cent. on the original capital. We read occasionally of collieries that have paid ten and fifteen per cent. dividends. At the present time, because of the abnormal and inflated state of the coal market, there are collieries in Great Britain that are showing very large returns; but if the history of these same collieries comes to be reviewed from the sinking of the shafts until the last pillars are taken out, it is probable that the percentages of returns to shartholders, landlords and labor will not be very different to the figures quoted by Mr. Walker.

Mr. Walker pleaded for recognition of the essential identity of the interests of capital and labor, and the necessity in these times for both to adopt all the aids that science and machinery can afford. With this all thinking men will be in hearty accord.

Apart however from the desirability for co-operation between capital and labor, a condition which would be much easier of attainment had all employers the same high sense of duty that the speaker possesses, there are other features which explain to some extent the small returns on coal-mining investments.

A disproportionately large part of the ultimate price to the consumer is made up of transportation charges and middlemen's profits. There seems no good reason why large colliery combines should retail coal through the medium of dealers, and quite recently Lord Rhondda, speaking of the acquisition of the Northern Navigation Collieries, expressed the intention of his company to eliminate the middlemen in the sale of coal. The average man would hardly believe how small is the price received for coal at the pit-mouth compared with the price he has to pay for the same coal delivered into his cellar. Anything more wasteful and unscientific than the manner in which coal is peddled out to the ultimate consumer could scarcely be conceived. The amount of re-handling, storing, trucking and bagging that some coal undergoes is ridiculous, and it results in an equally ridiculously high price to the consumer, and a low yield to the colliery owner.

Some day it may dawn upon us that it would be easier to transport the energy that lies in coal by converting it into electricity than by hauling a heavy material thousands of miles in ships, and cars and horse teams, and re-handling it until all semblance to the original mined product is lost.

If the colliery owner wishes to obtain the legitimate reward of his investment and his labor, he must prepare not only to mine coal, but to sell it to the ultimate consumer. He must apply scientific methods to the transportation of coal, and must be prepared to sell power in many cases instead of the raw material that he mines. Lord Rhondda, in the statement previously referred to, said he intended to establish a bureau of research, in which would be concentrated all the brains that could be secured, and in which would be collected also all possible information regarding new and improved mining methods in all parts of the world. Some little attention on the part of this bureau to sales and transportation would repay the trouble. A greater increment of profit per ton of coal is added by the dealer in many cases than is received by the colliery owner. The reason is not far to seek. The archaic methods of transportation seen in many cities, where half tons of coal are hauled over bad roads by decrepit steeds, are in sharp contrast to the great sums invested at the modern colliery to cheapen and quicken the cost of transportation underground. The cost of hauling coal on steam railroads is so tremendous as in many instances to be absolutely prohibitive. The reason again is not far to seek. Bad grades, poor rolling stock, inadequate sidings, single tracks, and a general inability to haul heavy loads for long distances at reasonable rates of speed, characterise too many railroads. It is evident then, that if the coal-owner wishes to reap his proper share of the ultimate cost of coal as it is landed in the cellar of the householder, or the bins of the factory, he must extend his interests, and must engage himself not only in the actual mining of coal, but in its transportation and sale. Colliery engineers consider themselves to be justified in expending large sums to save a cent or a half-cent per ton on the coal output, but how many cents are wasted once the coal has passed out of the colliery yard and started on its long and chequered journey to the factory boiler-house, or the humble domestic fireplace?

It is often said of a certain class of miners that they work for wages like horses and spend the wages like asses, and the analogy seems to hold good in respect of the material they mine.

## MATHEMATICS AND ENGINEERING

The study of mathematics is generally conceded to be invaluable as a training in logical thinking. There is however, considerable difference of opinion as to how much time an engineering student should devote to courses in mathematics, and what branches he should take up in that time.

Some engineers do not consider advanced courses essential, and would prefer to have been more thoroughly drilled in the elementary branches. Others advocate giving engineering students all the mathematics they can absorb, which may be much or little. The efforts of teacher and student are often wasted when too much is attempted.

In a recent article in "Engineering Education," Mr. H. D. Gaylord says:

"We must consider the question of the purpose of the mathematical courses in the preparation for the engineering profession. The question arises whether these courses are intended as tools or as general mental training, or as both. Here we must contrast the opinions of three classes of critics.

"First, the engineers themselves for the most part consider these elementary subjects as tools. The following quotation is an illustration: 'To the engineer, mathematics should be taught as a useful tool, and not as an interesting pastime, or as mere mental gymnastics.' Second, the mathematcians consider the mental training an important part of all mathematics, and deplore the tendency to determine the value of a subject on the basis of its practical applications. Third, many psychologists believe that mental ability cannot be automatically transferred, and hence, that the study of mathematics can give ability only for more study of mathematics. The psychologist will thus agree with the engineer that mathematics should be studied only as a tool, since, in general, there will be no transferable mental ability acquired. If this transfer cannot be made, the study of any subject requiring reasoning ability will train the student as effectively as the higher branches of mathematics, unless these branches contain the elements of applicability which can be made appreciable to the student at the time he is studying them.

"It is fair to assume that the mathematics through a first year of calculus is given by the engineering schools because they believe that it is needed by the student for the purpose of understanding the various engineering courses he is studying. It may be admitted that this thorough understanding of the theoretical engineering courses is not necessary in the actual practice of the engineering profession. In fact, the educator is well aware that the actual problems arising in the engineer's experience may never involve the necessity of applying the details of calculus to the question in hand. He feels, however, that some knowledge of the methods involved in developing the theory upon which the problem depends, perhaps the method of deriving the hand-book formula which solves the problem, in some way gives the engineer who has this knowledge a distinct advantage over his less fortunate brother."

Relatively strong emphasis on the applications of mathematical theory to the problems arising in practice is what the engineers desire. Relatively strong emphasis on the theoretical side of mathematics seems to be what the mathematics departments are offering. Hence the contention by the engineers that for the purpose of preparing students to enter the engineering profession, more emphasis should be given to the applications of mathematics and less to mathematical theory. Of course no general conclusion can be drawn from the fact that a given engineer thinks that too much emphasis was placed on mathematical theory in the course which he took. We cannot criticize mathematics departments in general because a few fail to appreciate the needs of engineering students.

"For this reason, much care was taken in sending out inquiries to include widely different parts of the country and to include many engineers who have received their training within the last ten years. The latter precaution enables us to avoid conclusions which might be true of mathematical courses twenty-five years ago, but which are no longer true because of changes in the methods of teaching. In view of this precaution it is interesting to note that from five different fields widely distributed both geographically and professionally, comes the testimony that unless the courses can be given with more emphasis on the applications, no mathematics beyond trigonometry is essential.

"There seems to be a decided opinion among both professors of engineering and professional engineers, that, beyond a certain amount of elementary mathematics, which would probably include arithmetic, algebra, plans and solid geometry, and trigonometry, the mathematics offered to engineering students should be taught with more emphasis on the applications of the subject to engineering problems. The pure mathematician, however, believes that there is a training quality to be obtained from the study of abstract mathematics which will be lost if the subject is taught through the study of its applications to any other science or profession. The mathematician believes that 'Mathematics is a basal science and not a tool. The spirit of mathematics is of more value to the engineer than the particular things which can be accomplished. The engineer need not be a mathematician, but he needs to think mathematically; and to my mind, he needs the power of mathematical thought more than skill in manipulating a few mathematical tools in mechanical fashion.'

"In this connection, it is evident that the time element must be taken into consideration. One professor of mathematics says, 'It is possible that better results could be obtained if the mathematical department had more time, say for a course in applications of mathematics to miscellaneous problems. But, as a rule, in our technical schools, the department of mathematics is allowed barely time to teach the necessary technique, with what illustrations and applications can be squeezed in. Hence, the mathematical department delivers to the engineering department an unfinished product; and it is the engineer's duty to teach the student to use the mathematics he has learned. Unfortunately, the professor of engineering is a poor mathematician and avoids this duty.'

"At this point, it seems to us, we have the suggestion of a possible remedy for the condition complained of by the engineers—a course given by a thoroughly trained mathematician who has sufficient knowledge and sympathy for the engineering profession to be able to illustrate all the mathematical theory by problems drawn from the engineering field. Such a course must be allowed a much greater time than that now allotted to the pure mathematics course which does not stop to take up applications; but if this kind of training is desirable for the engineering student, certainly, time should be found to give it.

"It is not the purpose of this investigation, however, to formulate the remedies for the undesirable conditions. It is sufficient for our purpose to set forth those conditions in definite form, and to formulate the opinions expressed in the data presented by those who are in touch with the undesirable conditions. These opinions may be set forth in four distinct conclusions:

"First, from the standpoint of the engineer, abstract mathematics divorced from its applications is not desirable in branches beyond trigonometry, i.e., mathematics beyond trigonometry is, for the engineering student, a tool and not a desirable end in itself.

"Second, these subjects being desirable as tools, the training in the elementary mathematics through trigonometry should be more thorough in order to enable the student easily to manipulate such parts of the higher branches as he may need in his profession.

"Third, study of theoretical mathematics beyond a year of calculus is not only undesirable, but is an actual hindrance to the practising engineer in adjusting himself to the relative values of the physical and mathematical sides of the problems which arise in practice. Hence, more emphasis on the applications of mathematics to physical problems should be given in mathematical courses for engineers.

"Fourth, such exceptional students as become interested in the theoretical side of the profession should be given ample opportunity, when that interest appears, to extend their mathematical training in whatever line may seem desirable for the particular branch of the profession in which they may desire to perfect themselves."

## BOOK REVIEWS.

**CONCENTRATING ORES BY FLOTATION — by Theodore J. Hoover—3rd Edition, 1916—Published by The Mining Magazine, London—Price 12s. 6d—For sale by Canadian Mining Journal.**

The first edition of this book was published in 1912 and has been an important factor in the development of the art. The author and his associates, through this work, and a second edition published in 1914, contributed information invaluable to those who took up the problem of concentrating ores by flotation.

The new edition contains the matter published in the second edition and also a chapter covering briefly the progress made during the past two years.

The chapter headings are: Historical; sketch patents; litigation; theories; tests; Potter-Delprat process; De Bavay process; Elmore vacuum process; minerals separation process; other flotation processes; economics; bibliography; progress 1914-1916.

**THE MINERAL INDUSTRY, Its Statistics, Technology and Trade during 1915—Edited by G. A. Rousch—Published by McGraw-Hill Book Co.—Price $10—For sale by Book Department, Canadian Mining Journal.**

This is volume xxiv. of the annual review of the world's mineral industry, founded by Richard P. Rothwell. The object of the work is to bring together as complete a record as possible of the year's progress in the mining and metallurgical industries in all the important producing countries and to give to the reader a general view of the entire field so far as information is available. A large number of specialists have contributed articles, and the editor has succeeded in compiling useful information on all the economically important minerals.

In addition to the main part of the book, in which the minerals are taken up in alphabetical order, there are special chapters on: Ore dressing and coal washing; concentration by flotation; data of the world's principal mines; and mineral statistics.

The book is a large one of 941 pages, but owing to the wide field covered, individual mining districts receive but little notice. The object of the work has, however, been achieved by careful selection of data from all parts of the world.

The statistical information is not as complete as in earlier volumes of the series. Naturally the production of some countries is not very well known.

An interesting feature of this edition is the prominence given to the minerals and metals for which the war has created a special demand.

**MINING WORLD INDEX OF CURRENT LITERATURE—Volume IX.—First half year 1916—by Geo. S. Sisley—Published by Mining World Company, Chicago—Price $2.00—For sale by Book Department, Canadian Mining Journal.**

The Mining World Index is an international bibliography of mining and the mining sciences, compiled and revised semi-annually from the Index of the World's Current Literature appearing weekly in "Mining and Engineering World." The world's literature on mining appearing in periodicals published in America, Europe, Africa and Australia, papers read before technical societies, reports of Government surveys and mining bureaus, and new books are carefully classified and indexed by subjects and authors.

The Mining World Index is the only one covering the field. Anyone who desires a key to the literature on mining subjects will find the volume exceedingly useful.

## UNITED STATES EXPORTS OF NICKEL.

The United States Department of Commerce in a report on foreign commerce gives the following figures, which are interesting to Canadians because nearly all the nickel exported by the United States, as well as that used in the United States, is of Canadian origin:

| U.S. exports of nickel to | July, 1916. lb. | 7 mos. ending July, 1916. lb. |
|---|---|---|
| France | 470,085 | 1,960,880 |
| Italy | 180,951 | 1,223,533 |
| Netherlands | 302,917 | 312,660 |
| Russia in Europe | ..... | 3,018,800 |
| United Kingdom | 1,681,723 | 10,437,968 |
| Other countries | 760,286 | 2,085,810 |

## NOT CANADIAN NICKEL.

Referring to Lord Robert Cecil's recent statement that nickel had reached Germany from United States by the Deutschland, Hon. Howard Ferguson says: "The statement of Lord Cecil that there is reason to believe these particular metals were a part of the small stock mined in allied territory, obviously has no reference to nickel mined in the Province of Ontario. Ontario mines and markets 85 per cent. of the nickel of the world. Therefore the words 'a small stock mined' can have no reference to this province. Had he meant Canada he would have said so. The United States Nickel Refining Co. gets ore from New Caledonia. What we do know as a result of our eternal vigilance is that the Deutschland didn't get any nickel from the International Nickel Co."

## CONSOLIDATED M. S. & P. CO.

The prospectus of Consolidated Mining and Smelting Co. in connection with the new stock issue indicates that payments must be made in four installments, as follows: 25 per cent.—$6.25 per share on application December 1st; the same amount on or before the four following dates: January 1st, 1917, February 1st, 1917, and March 1st, 1917. The amount may be paid in full, but only when it is paid in full will any dividend be paid on the new stock. If payments are not made on the days mentioned, or before, rights are liable to forfeiture. Rights expire December 1st at noon. The basis of distribution is one new share for every four held.

In a circular which Mr. W. T. Matthews, president of the Consolidated Mining and Smelting Co., is sending to shareholders, he states that after paying dividend the company will have fair surplus profits from the year's business. The object of the letter is to explain the need for increasing the company's capital, which he attributed to heavy construction costs, increased costs of labor and supplies, and a comprehensive plan of expansion.

### Copper and Zinc.

The plants of the company are producing more metals than ever before. The new zinc plant is shipping regularly, and shipments will increase steadily. The two zinc contracts from Allied Governments, which were accompanied by partial advances only, will necessitate additional capital expenditures. The copper plant has been increased in capacity and two plants for the production of sulphuric acid solutions have been installed, which will reduce refining costs.

The company's mining operations have been extended and further extension is in view. Not only has the large copper property close to tidewater at the northern extremity of Vancouver island been purchased, but other properties are now being examined with a view to purchase. The acquisition of new properties and the development of same will absorb more money. In view of the fact that the company is refining five metals, on a large scale, even the capital about to be added will make the total outstanding a comparatively small figure.

## UNITED STATES COPPER PRODUCTION.

Present indications are that for the year 1916 U. S. refinery production of copper, including all the product from both domestic and imported ore and concentrates, will average about 175,000,000 pounds per month. It has been as high as 190,000,000 and as low as 150,000,000. An output of 2,100,000,000 pounds for the twelve months would represent an increase of 28 per cent. over the refinery production of 1915. For the first time in the history of the industry the output promises to cross the 2,000,000,000-pound mark. We compare United States refinery outputs for a series of years as follows:

| | Output, lbs. |
|---|---|
| 1916 (estimated) ..... | 2,100,000,000 |
| 1915 ..... | 1,647,000,000 |
| 1914 ..... | 1,533,781,000 |

## COPPER FROM THESSALON.

Mr. John A. McEacherne has made a shipment of copper ore from one of his properties in Gould township north of Thessalon, Ont. The ore averaged 16 2-3 per cent. copper.

## MR. E. P. MATHEWSON.

Mr. E. P. Mathewson has returned to Canada after 30 years' experience as a metallurgist in the United States, including 14 years as manager of the reduction works of the Anaconda Copper Mining Co., to become general manager of the British American Nickel Corporation. He will reside in Toronto.

Mr. Mathewson was born in Montreal and attended McGill University. After graduating he spent one season assisting Mr. Eugene Coste, who was then engaged in making a topographical survey of the Trent valley. Then for a short period, Mr. Mathewson was employed in his father's store as bookkeeper, an experience which later proved of considerable value. He wanted, however, to follow up the profession of metallurgy. On the advice of Professor Harrington and T. Sterry Hunt he started for Colorado with a letter to the manager of a lead smelter at Pueblo. At the Pueblo smelter he began work in the assay office at a salary of $50 per month. He worked 13 hours on the night shift for two weeks and then 11 hours on the day shift.

Gradually Mr. Mathewson advanced, and it was not long until he was in charge of the plant as metallurgist. His company was smelting lead, silver and gold ores, and refining lead and silver, and so he gained experience in several departments. The introduction of machinery for every possible purpose made the Pueblo plant a very efficient one.

In 1897 Mr. Ben Guggenheim placed Mathewson in charge of the Philadelphia smelter, and a few months later took him to Perth Amboy to run the copper and lead refineries. For a few months Mr. Mathewson was at Monterey, but he was back at Perth Amboy in 1899. In that year he went to Chile to run a smelter for a company which had a contract with the Guggenheims. Of Mr. Mathewson's experiences in Chile, a volume could be written. After two years he returned to New York.

Mr. Mathewson was next interested in the possibility of starting an eletrolytic refinery in British Columbia. Before his plans matured, however, he was invited by Mr. Frank Klepetko to join the Anaconda staff, and until a few weeks ago he was still with the Anaconda company.

The period during which Mr. Mathewson was general manager will always be one of the brightest in Anaconda's history. His improvements in methods have kept Anaconda foremost among the companies treating copper ores. Increase in capacity, reduction in cost, and increase in percentage recovery have seldom been striven for so successfully as by Mr. Mathewson and his staff at Anaconda.

## REX CLAIMS IN DEAL.

The Pas, Oct. 21.—A deal has been consummated between the owners of the Rex group and Walter Neal, representing a New York syndicate, headed by McKeever Brothers, whereby immediate development of the property will be undertaken. A contract has been let for the erection of camp buildings to accommodate twenty men, who will be engaged in sinking a shaft and drifting, so as to block out the ore sufficiently to determine the size of the stamp mill that Mr. Neal undertakes to erect inside of two years, or earlier if the conditions warrant.

Mr. F. G. Stevens, who negotiated the deal, left on Wednesday for Toronto, and Mr. Neal remains in town arranging for immediate work to begin.—The Pas Herald.

## McINTYRE.

President A. M. Hay has issued the following statement concerning the operations of McIntyre-Porcupine Mines, Ltd., during the quarter ended September 30th:

There was milled 28,933 tons of McIntyre ore, containing $9.08 per ton, and yielding $250,744 at a cost of $142,900, or $4.93 per ton. The profit was $107,844. There was also milled 6,877 tons custom ore at a profit of $28,239, making a total profit of $136,083 for the quarter.

No. 5 Shaft.—Vein 714. The face of the drift is now 320 ft. east of 7D crosscut on the 700-ft. level and shows about $15 per ton over a width of 5 ft. North of this vein and paralleling it on the same level, No. 5 vein has been drifted upon for 280 ft., assaying for this length about $10 per ton over an average width of 5 ft. The raise from the 1,000-ft. level, to connect with the 700-ft. level of this shaft, is now 200 ft. above the 1,000-ft. level.

No. 4 Shaft.—On the 800-ft. level a new vein 5 ft. wide, assaying $6.85 per ton, has been drifted upon for 60 ft. east of the shaft and is still in ore. Drifting to the east on the 700-ft. level, has also proceeded about the same distance, but so far no new orebody has been met with. During the period these workings on the south side of the lake produced about 40 per cent. of the McIntyre-Porcupine ore milled, having a value of only about $6.50 per ton, thereby reducing the general average to $9.08 per ton.

McIntyre Extension Mine (Main Shaft).—Drifting is being continued to the east on the 1,000-ft. level, but no stoping operations are being carried on, as the present equipment is being used to its full capacity in carrying on development work planned for the economical handling of ore to be hoisted through this shaft in the future from the north side of the lake. The high operating cost shown over the period is due to the fact that all this extraordinary development is being charged against McIntyre Porcupine production, and will continue to show a relatively high figure until this work is completed. An adjustment of these charges will be made later on after production from the McIntyre Extension property has begun.

McIntyre Jupiter Mine.—About 70 tons of ore is being milled daily from this property.

Milling Operations.—The addition to the mill building and the installation of tank equipment for the D unit are now practically completed. When transportation facilities from the main shaft on the north side of the lake are available, the milling capacity will be raised to 500 tons per day without increasing the present crushing capacity of the mill. When the latter is increased the capacity of the mill will be 600 tons per day.

Main Shaft.—Drifting to the west on the Boundary vein on the 1000-ft. level has now been advanced for a total length of over 300 ft. on McIntyre-Porcupine ground. The stope for a similar distance on the sill floor, 18 ft. above the level, has carried a width of from 8 to 30 ft., with an average value of over $15 per ton. The present face is about 18 ft. wide of similar grade. Foundations are being placed on the surface at the main shaft for a crusher house and storage bin from which all the ore from the north side of the lake will be conveyed to the mill by a new aerial tramway now under construction, with a capacity of 60 tons per hour. The existing aerial tramway, in operation from No. 5 shaft, although taxed to the limit, is unable to keep the mill supplied to its capacity. The main shaft equipment, including hoist, crusher, ore bin, and aerial tramway, should be completed about the 1st of January, when the mill tonnage will be increased.

The amount expended during the quarter on new buildings, plant and equipment amounted to $27,966.85.

## INTERNATIONAL NICKEL CO.

Boston, Oct. 25.—International Nickel Co. made profits of $6,344,246 in the six months ended Sept. 30, while surplus after dividends amounted to $3,566,793. From the semi-annual statement just issued it becomes apparent that the third quarter of the year practically duplicated the June 30 quarter, in which profits were $3,959,135.

In both periods earnings were of record proportions. Cash at the end of September was down to $2,081,110, against $4,137,633 on June 30, but on the later date certificates of deposits had grown to $4,280,000 from $2,030,000 at mid-year.

The consolidated profit and loss statement for the six months ended Sept. 30 follows:

| | |
|---|---|
| Earnings | $7,775,145 |
| Other income | 137,628 |
| Total income | 7,912,773 |
| Administration and general expense | 563,896 |
| Net income | 7,348,876 |
| Depreciation and mineral exhaustion | 1,004,630 |
| Profits | 6,344,246 |
| Dividends | 2,777,454 |
| Balance | 3,566,793 |

Following is the balance sheet as of Sept. 30:

| Assets: | 1916. |
|---|---|
| Property | $44,193,831 |
| Investments | 2,003,396 |
| Inventories | 4,773,758 |
| Accounts receivable | 2,045,156 |
| Loans on call | 515,000 |
| Certificates of deposit | 4,280,000 |
| Cash | 2,081,110 |
| Total | 50,892,251 |
| **Liabilities:** | |
| Preferred stock | 8,912,600 |
| Common stock | 41,834,600 |
| Accounts payable | 1,951,255 |
| Preferred dividend | 133,680 |
| Common dividend | ..... |
| Account and insurance funds | 199,119 |
| Previous surplus | 3,294,195 |
| Profit and loss surplus | 3,566,703 |
| Total | 50,892,251 |

## BOSTON CREEK.

The R. A. P. Syndicate's property at Boston Creek, was closed down this month to permit of boiler repairs and installations, the latter including tables for sorting ore. The R. A. P. hopes to ship some high-grade shortly. The property will be opened up again in a week. In the meantime Harry Simms will take hold as manager.

The Boston Creek Gold Mines, Limited, which has the Kenzie property and a large group of other claims at Boston Creek, is starting work on its own account. The R. A. P. has been drifting from its workings on the Kenzie claim. The company is setting up a compressor and other equipment and will sink on the Kenzie claim.—Cobalt Nugget.

## MINING POSSIBILITIES ALONG CANADIAN NORTHERN RAILWAY, WEST SHINING TREE TO NIPIGON.

By Cyril T. Young.

The formations enclosing the rich Porcupine belt unquestionably extend west across our line at Groundhog River and Foleyet divisional point, and so far as our exploration goes, continues west and quite probably is the same gold formation as outcrops at Hobon on the C.P.R. north of Michipicoten Harbor.

Large quartz bodies occur in formations identical with Porcupine, but there has been no development so far to discover where the rich areas occur. Schist formations outcrop along the line between Tionaga and Foleyet—a distance of approximately twenty-five miles. This is the extension westward of the Porcupine gold belt which has been definitely traced through. On this belt the Cripple Creek area between the C.N.R. and Porcupine is located. On this belt prospectors have secured assays of from $6 to $30 per ton on good veins, but little or no work has as yet been performed, and for the greater part it was winter staking. The gold belt through here lies immediately south of a magnetite iron range which is exposed by stripping and tested by diamond drilling on the Groundhog river one mile north of the railway bridge. Further east, in the vicinity of Deerfoot lake, this iron belt is associated with a nickel-bearing formation referred to later.

A mining engineer who looked at a prospect west of Aquesqui Lake states that conglomerates such as we find at the Dome in Munro township, at Kirkland lake and elsewhere, occur on this belt. This formation occurs in all the prominent producing districts in Temiskaming and is considerably different from the silver-bearing conglomerate at Cobalt.

Between the railway track and the northeast arm of Lake Matagama, a promising schist belt, carrying large bodies of quartz on which some staking and work was formerly accomplished is well worthy of exploration.

West of the Groundhog river, in the vicinity of Slate Rock lake, quartz veins occur. Some of these occur in the rock cuts, and all of them are open to prospecting at the present time as the property staked was not recorded.

This gold belt continues west across the big lake back of Foleyet and outcrops here and there across the Trout and Chapleau rivers, continuing west across the Algoma Central to Hobon on the C.P.R. line and Michipicoten Harbor.

The continuation of the West Shining Tree gold belt is also well worthy of exploration. The easiest method of reaching this belt, is from Gogama Station by canoe southward ten miles on Misnisinaqua lake, where quartz showings are visible at the foot of the high trestle at the southerly end of the lake and in the rock cuts to the westward. On the westward extension of this belt at construction mileage 109 where the Macaming river crosses the steel and the canoe route is on ahead up the river through Macaming lake and Massmakanda lake (two short portages) and then southward to Schist lake. This section has not received the attention of mining men and prospectors, but stakers have been through it and my men say it is very promising.

West Shining Tree camp is already well known and several groups of properties in McMurchy township give every evidence of becoming mines, and are recently in the hands of more progressive mining men.

Quartz and schist occur at a number of places to the westward, and a schist belt crosses Kabinagagami lake at the outlet of the river of the same name. This is reached from Oba, the junction of the Canadian Northern and Algoma Central. The canoe route has two short portages.

Quartz showings on the same belt again occur further westward up the branches of the Shekak river, and were reported to me as occurring again on the same belt still further westward. No exploration work has been done at any of the points or through the intervening miles of country, but these places were noted by our land and timber cruisers when travelling across the country.

Between Long lake (Longuelac) and Jellicoe, which is on the border of the Nipigon Forest Reserve, especially in the vicinity of Langmuir and Keemle, a schist formation occurs which is worthy of exploration. This is an extension of the same belt as Kowkash and Tashota occur in further north on the Transcontinental. This section is well worthy of exploration, especially north of our line between Octupus and Jellicoe.

A Mr. Barron, reporting for the Ontario Government for many years on Northern Ontario Exploration, a most capable and efficient mining engineer, gives an interesting report on the Ground Hog section:

"I met with lead and copper ores on the northwest side of the eastern arm of Lake Matagama, in the vicinity of Flying Post. The quantity of ore in the veins, where exposed, is not such as would justify, in my opinion, expensive mining operations, but sufficient taken in connection with the size and general character of the veins to warrant careful exploration, in the reasonable expectation that larger deposits of these useful and valuable metals may be discovered. It is said that one of the parties engaged on the survey for the Canadian Pacific Railway, discovered silver ore in the neighborhood of Flying Post. I think it likely, however, that the ore thus found was 'lead ore' rather than silver. Galena, the most common ore of lead, almost invariably contains more or less silver, sometimes in quantities barely sufficient to pay for extraction, and at others so rich as to entitle the ore to be classed as 'silver-lead.' The formation in which these veins occur belongs to the Huronian system."

That native silver was found by the C.P.R. surveyors is a fact that came within the writer's knowledge years ago. The men who found it have since been in the Yukon and never returned east. This old survey line of the C.P.R. can be picked up in places north of our line at points between Mount Horden (north of Agate on Kapuskasing lake) and Groundhog river, and the maps we have prepared set forth the exact location of this survey.

In an early Dominion report by Bell, he sets forth on a map—now out of print—the place where Borron found the silver-lead veins as being on the point between the two arms of Matagama lake well down towards the chain of lakes on the portage between Flying Post lake and the eastern arm of Lake Matagama. It is a country well worthy of exploration, and what Borron found has not since been located either by Indians or white man. This formation seems to extend westward where bloom and native silver flakes have been reported to have been found.

Further west, diabase outcrops on the portage on Missinabi river at the falls below Peterbell siding. Diabase outcrops again on the eastern shore of Lake Nipigon, north of a line due west of Jellicoe Station.

Magnetic iron ore occurs at several points along the line of railway, the first of importance north of Ruel,

being 14 miles to the west of Stackpool at mileage 105 at Sagatosh lake. Here Minneapolis and St. Paul capital has proved up millions of tons by diamond drilling within the past four years, the diamond drilling outfit having gone in from Bisco on the C.P.R. They are well satisfied with their results.

At Kukatush, mileage 133, close to Groundhog river, magnetite, low in phosphorus and sulphur, occurs running in an east and west direction. Diamond drills were working here recently. Magnetite occurs again on the line at Mackay lakes, mileage 91 from Hornepayne, and in larger quantities at Octupus, mileage 109 from Hornepayne on the shores of Little Long lake.

The pyrrhotite ores northeast of Tionaga have on certain analysis yielded 2¼ per cent. nickel, but I was not able to obtain satisfactory results on properties that we optioned in this vicinity and notified the owners that we could not consider them. Were it immediately adjacent to the line of railway this section would warrant investigation for the production of sulphuric acid. Nickel is also reported to me from the Minnipuka vicinity and further west. It is also reported as occurring between our line and the C.P.R. north of Schrieber. I have had no opportunity of investigating this statement, nor to obtain its exact location. Men are now out on the ground acquiring properties.

At Sagatosh lake, 16 miles west of Stackpool reached from Groundhog (Kukatush) American interests have diamond drilled a strong lead zinc vein to 500 feet depth. They are seriously considering taking out ore and hauling it 14 miles to our rail.

## SAM DOBIE'S DEALS.

Sam J. Dobie is one of our best known mining men, says the Toronto World. He is always active in the new districts and as a rule comes away with substantial interests in promising properties. But it is rather as a vendor that he is best known to fame. Most of the properties that he has parted with at nominal prices have afterwards turned out veritable bonanzas. At one time he owned a large share of the famous "Croesus" in the Township of Munro, about 30 miles east of Porcupine. Even then there was little or no doubt of the great value of this property. Fabulously rich ore showed in several places, and to protect it from high graders the owners bolted down over the entire surface sheets of solid steel half an inch thick.

The Ontario Government paid $10,000 for a chunk of ore, the dimensions of which were not greater than an ordinary pumpkin. And this was no fancy price. It was barely commensurate with the intrinsic value of the sample. It was easy for the officials to determine this by ascertainng the weight of the entire specimen and the fineness of the gold therein. If free from any alloy, the metal would be 19.3 times heavier than water, while the gangue or quartz is only 2.65. The bulk of the valuable piece could be acertained by measuring its displacement of water, and on these data a calculation of actual value could be made.

The ore acquired by the Government was shown in a safe at the National Exhibition in Toronto. Lumps of pure gold studded the quartz like raisins in a Christmas pudding; not merely here and there, but evenly distributed through the mass and, as nearly as one could judge, taking up more than one-third of the whole.

Sam Dobie sold his interest in the Croesus at the rate of $75,000 for the whole.

But a single generous act of that kind would scarcely be sufficient to establish his reputation as the best man to buy from in the whole of northern Ontario. He also had a large interest in the Davidson, which has very recently come into great prominence in consequence of simultaneous finds on two different veins.

Apparently it is lucky to buy from Sam J. Dobie. Will the Coniagas mines of Cobalt be the next fortunate buyers from him? He and his associate owner have optioned the Anchorite in the northern part of Deloro to the Coniagas, so in the ordinary course, we may expect a big strike on this valuable property.

## FLOTATION ROYALTIES.

Air flotation and not oil flotation governs the principles of ore concentration under the process of the Minerals Separation Co., according to its representatives in the United States.

It is estimated that licensees of the Minerals Separation Co. patents handle approximately 30,000,000 tons of ore annually at the present time. Further estimates double this volume to 60,000,000 tons as the amount of ore treated by flotation upon which royalties may at some time be collectible. This includes not only the copper producers operating in the United States, Canada, Mexico and South America, but Russia, Australia and other countries throughout the world.

Royalties range from 12 cents per ton of ore treated to a much lower figure when a large tonnage is handled.

The agreement which Anaconda Copper Mining Co. has with the Minerals Separation Co. covers probably the greatest tonnage of ore of any contract which the latter company has on its books. So far as can be learned the effect of the Bradford decision on the Callow process, if the decision is upheld by the Supreme Court, will probably not restrict the use of Callow machines, but will require users of the Callow machines to pay royalties to the Minerals Separation Co.

To licensees under its patents the Minerals Separation Co. sells its machines at cost, the profit to the licensing company coming entirely from royalties on ore treated.

Much stress has been laid upon the "oil flotation" phase of the process, but it is stated by the Separation Co. that it is in reality an "air flotation." Oil was used in the prior art, but the present discovery, according to its owners, makes it possible to "flotate" the fine particles in air bubbles resulting in much larger extraction and greater profits.

Preparations for carrying its case to the Supreme Court next month have been started by the Minerals Separation Co. Upon the outcome of this appeal, taken from a decision of the Circuit Court in San Francisco in the Hyde-Butte & Superior litigation, will depend the very existence of the company in the United States.

The Minerals Separation Co. has been busy securing new contracts with mining companies desiring to use flotation. Its best contract is understood to be that covering the Anaconda, Inspiration, Greene-Cananea, Arizona Copper Co., Calumet & Arizona Mining Co. and Consolidated Coppermines Co. upon which a minimum rate of four cents a ton prevails and is now being paid as the daily amount treated exceeds 30,000 tons.

It is doubtful if any other company or group of companies will secure such a low figure. The Braden mill has flotation equipment which has increased its saving materially. The Chile Coper Co. is also understood to have made arrangement to operate under the Minerals Separation process.—Boston News Bureau.

## MOLYBDENITE.

Nelson, B.C., Oct. 11.—Prof. J. C. Gwillim, of the Canadian Munition Resources Commission, is in Kootenay and Boundary inquiring into the possibilities for an increased production of molybdenite, which is in demand for munitions work. So far the Molly mine on Lost Creek is the only one he has seen which promises a production, but he believes that there may be other showings in the district which would pay for operation at existing prices for the metal.

He gave the Daily News the following memorandum concerning molybdenite, prices and methods of disposing of it:

"There is a good market now for the mineral molybdenite, which is needed for making ferro-molybdenum used in munitions and other work.

"The general price is on a basis of $1 per pound for 80 per cent. of the molybdenite content: 80 per cent. being the assumed recovery made in cleaning this mineral up to the grade required by the munitions board. This grade is 85 per cent. molybdenite.

"Thus a 5 per cent. ore would be worth $80 and a 10 per cent. ore $160 per ton, less the following charges: (1) Mining and sorting to 5 or 10 per cent.; (2) transportation from mine to railway; (3) freight to Ottawa or Renfrew, $16 a ton on carload lots; $36 a ton on smaller lots; (4) milling or concentrating cost, from $5 to $10 per ton.

"A little figuring for each case will determine what grade of crude ore will stand its charges — usually nothing under 5 per cent. molybdenite (not molybdenum) will leave much profit.

"There are two places in Canada where such lower grade ores can be cleaned up and paid for: The ore testing laboratories of the Mines Department, Ottawa, care G. C. Mackenzie; and the International Molybdenum Co., of Renfrew and Orillia, Ont. F. J. Mackenzie is its representative and is now in British Columbia.

"The Canadian Munitions Resources Commission is interested in getting supplies of this mineral forward as quickly as possible to meet war demands and anyone who can should try to furnish such ores while the price is high and the necessity exists."

## STANDARD SILVER-LEAD.

The Standard Silver-Lead Mining Co.'s net profits for the month of August were $41,280.56. Mr. Geo. H. Aylard, of Victoria, is general manager for this company, but its head office is in Spokane, Wash. The Spokesman-Review, of that city, a few days ago published the August figures, as under.

The operating profit at the property of the Standard Silver-Lead Mining Co., near Silverton, B.C., for September was $53,399, as compared with $56,609 in July, $38,437 in May, and $136,943 in March. The surplus of the company on August 31st was $287,662, as compared with $296,381 in July.

Production is maintained from silver-lead and zinc ores and concentrates. The shipments in August were 523 tons of silver-lead ore, as compared with 429 tons in July, 497 tons in June, 504 tons in May, 729 tons in April, and 1,295 tons in March.

The zinc sales were $18,482, as compared with $63,890 in July, $24,808 in June, $18,260 in May, $26,847 in April, and $5,432 in March.

The receipts from zinc in August were at the minimum because the contract with a buyer admits of the shipment of only 500 tons a month. The company states that it had on hand 750 tons of zinc concentrates made in August, that do not figure in this statement. The concentrates have been netting $30 a ton, and those on hand are expected to bring an equal return. Negotiations are proceeding for the sale of the surplus zinc which the company hopes to dispose of in its entirety.

Among details of the Standard Co.'s statement for August by Mr. Charles Hussey, the secretary, are the following:

**Receipts.**

| | |
|---|---|
| Preliminary settlement for 523 tons of silver-lead ore and concentrates | $64,926.50 |
| Zinc sales | 18,482.26 |
| Umpires | 178.91 |
| Boarding house | 5,275.55 |
| | $88,863.22 |
| Less final settlement for June | 2,290.41 |
| | $86,572.81 |

**Disbursements.**

| | |
|---|---|
| Production of ore, including mining, milling, shipping, power and general expenses | $33,172.89 |
| Development | 4,321.75 |
| Construction | 2,211.80 |
| Aylard tunnel | 1,747.85 |
| Store supplies | 3,599.35 |
| Miscellaneous | 238.61 |
| | $45,292.25 |

**Cash Statement.**

| | |
|---|---|
| Balance on July 31st | $296,381.65 |
| Net profit for August | 41,280.56 |
| | $337,662.21 |
| Less dividend payable | 50,000.00 |
| Balance on August 31st | $287,662.21 |

## TEMISKAMING.

In a letter, dated October 10th, to shareholders of the Temiskaming Mining Co. is the following:

The main shaft has reached a depth of 1,325 ft. We have approximately 300 ft. farther to sink before the lower contact between the Diabase and Keewatin formations is encountered, when lateral development will be commenced.

On the upper levels of the property, work is progressing very favorably. In various parts of the old workings, we have recovered some mill rock and small patches of high-grade. Development of the new vein system on the different levels has produced a great deal of very rich ore as well as mill rock. On the 500-ft. level, where we have our largest body of ore, the vein is very strong, varying from eight to fourteen inches in width and carrying exceptionally rich values.

Surface work on the McDonald claim and Gans lot has been suspended. The syndicate who had our Red Jacket claim under lease, have relinquished the same.

On September 30th, 1916, we had: Bullion in storage, 566,962.74 oz.; ore at smelters, 108,905.43 oz.; ore bagged at mine, 31,419.0 oz.; total, 707,287.17 oz. Cash on hand, $25,074.08.

On July 22nd, 1916, we paid a dividend of 3 per cent., distributing $75,000 among the shareholders. At a meeting of the directors held on October 10th, 1916, a dividend of 3 per cent. was declared payable on November 22nd, 1916, to shareholders of record October 31st, 1916.

## THE MINERALS SEPARATION CASE.

A Delaware court has decided the suit brought against the Miami Copper Co. on the ground of infringement. The following is an abstract of Judge Bradford's opinion:

The court holds that "under the processes shown in the three patents a signal advance has been made in the art of ore concentration in point of simplicity, economy and efficiency, and in their practice large commercial success has been realized." * * * He then cites other practices which, "however, were far from commercially successful, being wasteful of water, of power and of a considerable proportion of the metallic particles in the slimes which were carried up to the surface and were lost with the gangue.

"Without pausing at this point to consider other processes of ore concentration disclosed in the prior art hereinafter discussed an important and, indeed, vital difference between water or gravity concentration under such processes and concentration under the processes of the patents in the suit is that while in the former the metallic particles after being separated from the gangue in the ore pulp sand to the bottom, in the latter the metallic particles coated with an extremely thin film of oil became attached to air bubbles in the ore pulp and the bubbles with the attached metallic particles rise to the surface forming a mineral froth of such coherency and permanency as to afford full opportunity for its removal from the surface for further treatment of the metallic particles. The ore pulp in the process of each and every one of the three patents in suit consists of a mixture of water and crushed or pulverised ore, together with one or more other ingredients.

"In each the agitation of the pulp coupled with the introduction of air into it developes and distributes throughout the mixture small bubbles of air which attach themselves to the metallic particles to the exclusion of the gangue and rise with them and form metallic air froth on the surface readily removable therefrom, the gangue particles sinking to the bottom and being disposed of as refuse."

Judge Bradford in his opinion says that "the first patent in suit is what is known as an air flotation process in which the frothing agent consists of an oil or other immiscible substance or material of an oily nature and the bubbles and metallic particles become attached to each other through affinity between the bubbles and the metallic particles enhanced by the coating of the latter with an extremely thin film of oil. The old water processes of ore concentration were in some features gravely objectionable.

"Under those processes it was desirable to avoid very fine grinding of the ore as being calculated to cause the fine particles containing metal to escape with gangue particles and be lost. In these processes there were two things to be avoided: first, the crushing or grinding of ore to such a degree of finenses as to lead to the loss of metallic particles through their escape; and secondly, too coarse crushing or grinding whereby particles of ore containing both metal and gangue might, with the gangue preponderating, too readily be carried to the surface and lost with the other gangue particles.

"The defendant admits that the air bubbles collect the metallic particles and the oil or other modifying agent in the mixture gives permanency to the mineral froth; that the attraction of the air bubbles for the metallic sulphide particles leads to the separation of those particles from the gangue that in the absence of oil or other modifying agents in the pulp facilitating the formation of air or other gas bubbles, no process of concentration employing such bubbles is possible. * * * But there is an accentuated difference of opinion between the parties on the point of preferential affinity of oil for metallic particles as compared with the gangue.

"One of the principal questions in the case is whether patentable invention was involved in the discovery that the minute proportion of .1% of oil to the ore was sufficient for commercially successful operations in ore concentration. On this question I had some doubt during presentation of the case. But this doubt has since been removed. * * * There was I think patentable invention in the discovery made in March, 1905. Prior to that time there had been no suggestion in the art that the proportion of .1% of oil to ore or any other fraction of 1% of oil to ore would or might result in successful concentration. The statutes provide for patenting new and useful inventions and discoveries, but a bare discovery unaccompanied by the exercise of any invention in utilizing or reducing it to practice would not justify or support a monopoly in the discovery. In the present case, however, the facts disclose not a bare discovery, but a discovery coupled with invention in usefully applying it. In such cases patents may properly be granted. The defendant lays stress upon the proposition that the reduction in the amount of oil in the process for the concentration of ore did not and could not involve patentable invention, but only an ascertainment of the proper degree in which oil should be used, which was readily discoverable by any one competent to conduct or superintend a process of ore concentration; and further, that motives of economy would naturally have suggested a reduction in the quantity of oil to the extent of its excess over what was necessary for the accomplishment of the purposes of the process.

"But if such a reduction was obvious why is it that it was never made prior to the discovery in question? No one to-day understands how the use of only .1% of oil operates to secure the mineral froth of the first patent in suit. This is testified to by experts and admitted on both sides. * * * I perceive no escape from the conclusion that the discovery was patentable. To decrease the amount of oil used in an old process, so long as the characteristic mode of operation and result of such process are preserved, even though in less degree, does not as a general rule involve invention.

"The defendant contends that a substantial increase in the amount of oil involved used will not affect the nature or efficiency of the process of the separation, but will only add to the cost of carrying it on with an unnecessary amount of oil. But this position is in conflict with the decided weight of the evidence and with the showing of the experiments conducted by Higgins immediately prior to the time of discovery. It is satisfactorily proven that the process of first patent in suit depends upon the selective affinity of the air bubbles in the mixture for oil coated metallic particles, that the affinity is strongest when the film of oil surrounding the metallic particles is so thin as to be imperceptible to the senses, and that with any substantial increase in the quantity of oil on the metallic particles the character of the process is changed and its efficiency diminished for some reason as yet unrevealed.

"A great advance in the art of ore concentration has resulted from the process of the first patent in suit in efficient recovery of slimes. With the use of that process ore may be so finely ground as to insure the thorough separation of the metallic particles and gangue and

great savings effected. The profit so saved in a single year from the output of the principal porphyry copper mines, including the defendant's has been estimated by one of the expert witnesses as more than $17,000,000.

"The defendant contends that there is nothing new in the employment of only a fraction of 1% of oil relative to the weight of the ore in the process of the first patent in the suit. On the whole, I am satisfied that the first patent in suit must be sustained as to claims 1 and 12, but not as to claim 9. The two former are definite, specifying and limiting the amount of oil to be used; claim 1 mentioning 'a small proportion' * * * amounting to 'a fraction of 1% on the ore' and 12 'a fraction of 1% of oil on the ore.' Claim 9 mentions 'small quantity of oil.'

"On the question of infringement of the first patent I have no doubt. It was practically admitted by counsel for the defendant in opening the defence that it had infringed the three patents in suit by its operations at Miami within four months next before the filing of the bill. The defendant in its operations also used the minute proportion of oil mentioned in the first patent in suit. It does not use acid in its process, but this fact is immaterial so far as the question of infringement is concerned for the reason that it appears both from the claims and the description of that patent that the use of acid is optional. In the plaintiff's process the separation is effected through the rising of air bubbles to which are attached the metallic particles through the mixture to the top and the formation of a froth or scum on the surface, which can by simple means be removed with the contained metallic articles. In the defendant's process the separation is effected through the rising of air bubbles to which are attached the metallic particles through the mixture to the top and the floating away into a launder of either the original bubbles to which the metallic particles were first attached or succeeding and oncoming bubbles which have caught and buoyed up to the surface the metallic particles escaping from the bursting bubbles. The defendant contends that since its abandonment of its original infringing process at Miami it has not and does not infringe for the reason that it does not in its process produce the coherent and permanent froth of the process of the first patent. It appears from the evidence, it is true, that the bubble froth in the defendant's process is not as coherent and permanent as the froth of the process of the patent; but both are mineral froths and that of the defendant is sufficiently permanent to effect through air flotation and efficient separation of the metallic particles from the rest of the mixture. The defendant further insists that its process lacks violent agitation * * * but the description (of the patents) nowhere mentions 'violent agitation.'"

Regarding the third patent involved the court says: "I do not find any element of patentability in the process of this patent."

## ST. ANTHONY GOLD.

The St. Anthony Mine, of Sturgeon Lake, has been taken over by the Dominion Reduction Co., who are the owners of the "Croesus." Considerable development has been made on the St. Anthony under the managership of Julius Cohen, and the superintendency of Harry Lavery, late of the Dome.

## NIPISSING.

A strike of considerable importance is understood to have been made in the Meyer shaft of the Nipissing. From what can be learned the strike is very rich.

## TREATMENT OF COBALT SILVER ORES.

Within the past couple of weeks an increase has been noted in the bullion shipments from the Mining Corporation. This increase is due to the addition of a high grade plant to the Cobalt Reduction Co.'s mill.

Previous to this the slimes from the concentrator have been cyanided in the low grade cyanide plant. This system, of course, is being continued, but the "sand concentrates" instead of going to the smelters as in the past, will henceforth be treated in the new plant just recently put in operation.

In addition to the concentrates of the Cobalt Reduction mill, the high grade ore from the three mines of the Mining Corporation of Canada will also receive treatment here and in a short time practically all Mining Corporation shipments will be in the form of high grade bullion going direct to London.

The new addition to the Cobalt Reduction Co.'s plant differs radically from the two other high grade plants in the camp, in that amalgamation plays no part in the treatment, nor is the ore crushed in cyanide solution. The ore is first slimed in a tube mill, and after a preliminary treatment in two stages is de-watered and washed on an Oliver filter, then given cyanide treatment and again filtered and washed on a second Oliver filter.

The silver is precipitated from the solution by the use of sodium sulphide instead of aluminum dust, and the resulting silver sulphide precipitated, de-sulphurized, pumped to filter presses, and then refined in reverberatory furnaces, to a high grade bullion ready for shipment in bars to London.

The new plant has only recently been put in operation and in the course of a few weeks will be working to full capacity.—Cobalt Nugget.

## COBALT SHIPMENTS.

Cobalt, Oct. 21.—Eleven carloads of ore left the camp this week for the smelters. Nipissing led with 370,457 pounds. Three cars of nickel-cobalt residue from the Nipissing went to the Henry Wiggins Co., Birmingham, while another car from the same company went to Welland, Ont.

Right of Way again appears on the list with a car of concentrates consigned to Thorold, to which place the car from Beaver also went. The Dominion Reduction shipped to Denver. The remainder went to Canadian smelters at Welland, Thorold and Deloro. The total ore shipments totalled approximately 304,942 ounces, worth approximately $184,554.

Ore shipments were as follows:

| Shipper. | Pounds. |
|---|---|
| Right of Way | 84,052 |
| Nipissing | 370,457 |
| O'Brien Mine | 129,828 |
| La Rose | 87,143 |
| Dominion Reduction | 88,000 |
| Beaver Consolidated | 81,536 |

Bullion shipments were:

| Shipper. | Ounces. | Value. |
|---|---|---|
| Nipissing | 132,429.67 | $91,045.40 |
| Mining Corporation | 55,071.88 | 37,448.88 |
| Crown Reserve | 12,441.00 | 8,559.88 |
| Dominoin Reduction | 20,000.00 | 13,500.00 |
| O'Brien | 85,000.00 | 34,000.00 |

Crown Reserve, O'Brien and Dominion Reduction figures are only approximate.—Cobalt Nugget.

## WHAT YOU CAN DO FOR THE RETURNED SOLDIERS.

By A. R. Doble, President of The Khaki League, Montreal.

The Military Hospitals Commission and many official and private organizations are spending much time and energy in behalf of the returned soldiers, but every Canadian citizen should and can take an interest in the national heroes.

Many have neither time nor opportunity to join an organization for that purpose, but much is to be done by individual and independent effort, intelligently directed. Here are a few suggestions which may help you to do your part:

When you see in the papers that any of the boys are returning to your neighborhood, get together with a few of your neighbors and give them a hearty reception.

Don't treat them to alcoholic refreshments. Many of the men are not in normal state, owing to what they have been through. While, under ordinary circumstances, a drink might do them no harm, under present conditions it might be a very bad thing for them. You will not wish to do an injury to those who have endured so much for you.

Find out what jobs are vacant in your community. Make it a matter of pride for employers to give the first chance to a returned soldier.

Encourage the men to get back to work. Loafing is bad for them, as it is for any of us.

If you are an employer, give the returned soldiers a fair show. It may take a little time for them to get their bearings. Have patience with them, and encourage them,—they have suffered so much for you.

Be in a position to advise the returned soldier where to go in case of need. If you see one in any difficulty, try to help him out, or go with him where he can get proper attention. Help the men who have helped you.

Some of the places where information and assistance can be obtained follow:

The Military Hospitals Commission of the Dominion Government has its chief office at 22 Vittoria Street, Ottawa. Branch Offices,—Room 301 Drummond Building, 511 St. Catherine Street West, Montreal, Que.; and 1 Queen's Park, College Street, Toronto, Ont.

Here is a list of the Provincial organizations: Nova Scotia — Returned Soldiers' Employment Committee, Metropole Building, Halifax. New Brunswick—Returned Soldiers' Aid Committee, 49 Canterbury Street, St. John. Prince Edward Island—Returned Soldiers' Commission, Box 306, Charlottetown. Ontario—Soldiers' Aid Commission, Parliament Buildings, Toronto. Quebec—Soldiers' Employment Bureau, 64-65 Dandurand Building, 294 St. Catherine St. East, Montreal. Manitoba—Provincial Returned Soldiers' Commission, 185 Lombard Street, Winnipeg. Saskatchewan—Saskatchewan Division of the Military Hospitals' Commission, Leader Building Regina. Alberta—Central Provincial Committee of the Military Hospitals' Commission, Government Buildings, Edmonton. British Columbia— Returned Soldiers' Aid Commission, Parliament Buildings, Victoria.

Some of the Provincial organizations have local committees in many towns, and more of these local committees are being formed.

Then there is the Khaki League, which maintains at its Khaki Club, 660 Dorchester Street West, a Soldiers' Employment and Information Department in charge of a returned soldier, in addition to which it operates another Club at 184 Peel Street, as well as the Khaki Convalescent Homes at 46 Belmont Park and 128 McTavish Street.

Khaki Clubs are also established in the cities of Quebec, St. John, N.B., and Halifax.

In conclusion, take a personal interest in the returned soldiers. They don't need treating, nor coddling, nor charity, but they need human sympathy and kindness, as well as justice.

Canada owes her soldiers a debt which money can never pay. Will you do your bit towards paying it as above suggested?

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## HANDLING ORE AT HOLLINGER MINE.

When Hollinger's central shaft is placed in operation early next March a flow sheet unique in one respect in Porcupine will be introduced. The underground bin idea, something similar to that in use on the Gatineau-Alaska, is the main change.

The ore will be carried in trams run by electric locomotives along the haulage level to the main shaft, and there tipped into 750-ton loading pockets. From there it will be drawn off, the big lumps sledged or crushed, and will be drawn up in five-ton skips. At the shaft top the ore will be tipped into three No. 7 gyratory crushers and pass through trommels. The oversize will be recrushed in four No. 5 gyratory crushers.

When crushed the ore will drop directly into 500-ton storage bins, cut out in the side of the hill adjacent to the central shaft.

The tunnel cuts through the side of the hill to the bottom of the bins and from storage the ore is drawn up an incline plane to the top of the mill, from where it will be distributed to the stamp feeds.

The advantage of this flow system lies in the fact that haulage expense is reduced to the minimum through the employment of gravity to the greatest possible extent, and again in the fact that the building of storage sheds outside and heating of them is obviated.—Cobalt Nugget.

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## NOVA SCOTIA STEEL.

Boston—The roving eye of the stock market has searched out about every American steel company of merit, but so far little attention has been paid to the Nova Scotia Steel Co., Ltd., listed on the Boston Exchange. Nevertheless, Nova Scotia has assets and current earnings which are matched by few of the domestic companies whose shares have been making new records for altitude.

Nova Scotia Steel owns in fee simple or by crown lease over 80 square miles of land and submarine iron ore areas situated at Wabana, Belle Isle, Conception Bay, Newfoundland, near which are located ore shipping docks with ample storage capacity. This iron area is estimated to contain upwards of 2,000,000 tons of ore, and is recognized as the largest single deposit known. The company also holds leases on over 90 square miles of coal areas, limestone and dolomite properties, located in Cape Breton, N.S., estimated to contain 2,500,000 tons of coal. Furthermore, timber lands owned in Nova Scotia and Newfoundland exceed 65,000 acres, and freehold lands 8,000 acres additional. This takes no account of the coke ovens, blast furnaces, mills, etc., having a capacity of 120,000 tons of finished steel products per annum.

Nova Scotia owns the entire $800,000 common stock of the Eastern Car Co., Ltd., which has a capacity of 30 cars a day.

The present rate of earnings of Nova Scotia Steel, after charges and a generous allowance for depreciation, is at least $60 per share on the $7,500,000 common stock issued. This is declared to be a very conservative figure. Considering the fact that the iron ore business through insufficient capital in the past has never been developed to anything like the extent which is possible, the common stock is seen to possess interesting possibilities.

Nova Scotia Steel was one of the earliest Canadian beneficiaries of munitions contracts. It is understood that munitions work sufficient to absorb the increased output of all the company's furnaces, mills and forges is already booked for practically all of 1917. This embraces shell forgings—18 pounder shrapnel to 12-inch high explosive shells. Nova Scotia Steel laid down a plant powerful enough to forge 12-inch high explosive shells.

## PERSONAL AND GENERAL

Mr. W. A. Carlyle, formerly general manager of the Rio Tinto copper mines, is in Toronto. Mr. Carlyle is a director of the British-America Nickel Corporation. He was at one time general manager of the Le Roi, Josie, Nickel Plate, Columbia Kootenay and other mines in British Columbia. Mr. Carlyle is a graduate of McGill University and was at one time professor of mining in that institution.

Mr. E. P. Matheson is in Toronto after a brief visit to the Sudbury district in company with Mr. W. A. Carlyle. These gentlemen are now general manager and director respectively of the British-America Nickel Corporation. They attended McGill University at the same time, and are now recognized leaders in the mining profession.

Captain Alexander, chief owner of the Engineer gold mine, in Atlin mining division of British Columbia, has returned to the property from a trip to the State of Washington. He was accompanied by some prospective buyers of the mine who went to Atlin to examine it.

Mr. W. M. Brewer has returned to Victoria after having spent the field-work season examining mining properties and investigating conditions in parts of Vancouver island, with the purpose of preparing a report for the British Columbia Department of Mines.

Dr. D. D. Cairnes, of the Geological Survey of Canada, was in Whitehorse at the end of September, after having been engaged in geological investigations in Yukon Territory during the summer and early autumn. He went thence to Atlin district on a short visit before returning to Ottawa.

Mr. J. H. Cunningham, manager for the Canadian Collieries (Dunsmuir), Limited, at that company's Extension colliery, left Ladysmith, Vancouver Island, B.C., on October 11th, to visit his old home in Nova Scotia.

Mr. W. A. Cameron, manager for the Rambler-Cariboo Mines, Ltd., operating a silver-lead-zinc mine in the Slocan district of British Columbia, has been to Spokane, Washington, to confer with his directors relative to their mining enterprise, which has this year returned dividends to its owners after years of expenditure on deep development and additional plant and equipment.

Mr. Frank Jaynes is now manager of Nos. 5 and 6 mines of the Comox colliery, on Vancouver Island, B.C., owned and operated by the Canadian Collieries (Dunsmuir), Limited, in succession to Mr. J. H. McMillan, now a district mine inspector with office at Prince Rupert.

Mr. C. H. McDougall, one of the Consolidated Mining and Smelting Co.'s mining engineers who volunteered for active service and after leaving British Columbia, obtained a commission, was recently transferred from England to France.

Mr. W. T. McDowell, formerly of Fort Worth, Texas, is now manager of the Yankee Girl gold-silver mine near Ymir, Nelson division of British Columbia, having lately succeeded Mr. W. A. Buchanan.

Mr. Geo. J. Milton, head of the company operating a coal mine at Tantalus, Yukon territory, left Whitehorse on October 3rd for Minneapolis, Minn., where he will spend the winter. Mining operations at Tantalus have been suspended and the mine will remain closed until Mr. Milton's return to the property next spring.

Mr. Robert Musgrave is back on Vancouver Island after having made investigations in several mining districts on the lower mainland of British Columbia for the Provincial Department of Mines.

Mr. J. R. Rutherford, for some time manager of the Motherlode gold mine in Sheep Creek camp, Nelson mining division of British Columbia, for its Ontario owners, has returned to Ontario, going from Nelson to Cobalt district.

Mr. O. B. Smith, superintendent of mines for the Granby Consolidated Mining, Smelting and Power Co., and Mr. E. J. Conway, one of the company's field engineers, have been examining mining properties on the Queen Charlotte islands, British Columbia.

Prof. J. M. Turnbull, of the University of British Columbia's mining engineering department, has been examining mining properties in Skeena and neighboring mining divisions for the British Columbia Department of Mines.

Mr. J. Whittaker, a mine operator in the Coal Creek country, Yukon Territory, was in Whitehorse late in September on his way back to the interior, after having spent some time in England.

Mr. H. I. Wilson, of Butte, Montana, who is a director of the Kootenay Gold Exploration Co., has been at Nelson, on a visit to the Granite-Poorman gold mines which were acquired by his company several months ago.

Mr. D'Arcy Weatherbe, who had been in Russia, was in British Columbia early in October.

Mr. E. P. Mathewson has resigned as manager of the reduction works of the Anaconda Copper Mining Co. at Anaconda to accept the position of general manager for the British-American Nickel Corporation, with headquarters at Toronto. Mr. Mathewson is a Canadian who has been very successful in the United States and ranks among the world's leading metallurgists.

Mr. H. W. Dow has been appointed sales manager of the Nordberg Mfg. Co., Milwaukee.

Mr. George Rogers, who is developing claims in the West Shining Tree gold district, was in Toronto recently and has returned to Wasapila, Ont.

Dr. Chas. W. Drysdale recently visited Kaslo, West Kootenay, B.C. He was accompanied by Mr. M. N. Bancroft, also of the Geological Survey of Canada, who had been doing geological work in Fort Steele division of East Kootenay.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

The report of the United States consul at Fernie, Southeast Kootenay, for the quarter ended September 30th last, gives information relative to the exports to the United States from the Fernie district, which comprises the country lying north of, and contiguous to the International Boundary line, including Southern Kootenay and Boundary districts of British Columbia. The total exports of copper for the nine expired months of the year amounted to 4,741,861 lb., valued at $1,320,468. In the quarter under review there was exported gold to the value of $171,329, silver $52,664, zinc $160,074, lead $1,042, and coal and coke $305,455. It is stated, further, that the British Columbia Copper Co., with smelting works at Greenwood, in Boundary district, will discontinue the shipment of copper across the International Boundary line after November 1st, the Consolidated Mining and Smelting Co., of Trail, having contracted to handle the entire copper product of the former company, so that it will no longer be included in the exports to the United States. The Rambler-Cariboo Mines, Ltd., has contracted with a zinc smelting company in the United States to take the 800 to 1,000 tons of zinc concentrate accumulated at the company's mill in Slocan district.

### East Kootenay.

Concerning the shortage of labor at Crowsnest collieries, to which reference was made in last month's correspondence, the following comment has since been published in provincial newspapers: "There is one feature in the problem which is affecting production to a considerable extent. The manager of the British Columbia Copper Co. has been in Crowsnest district for several days trying to secure a larger supply of coke for his company, but has had to go away without any definite promise as to an immediate increase, owing to scarcity of labor. Five hundred more miners could be used to advantage in the Crowsnest coal mines. Secretary Carter, of the United Mine Workers of America board, reports a similar want of miners in the Alberta fields. The Georgetown mines, which were closed a short time ago, released about 120 miners who were quickly employed by the Drumheller Co. Hundreds more could be given work in the same field, while Lethbridge and other fields are also looking for more men."

The Moyie correspondent of the Nelson Daily News recently wrote that at the St. Eugene mine, Moyie, the Consolidated Mining and Smelting Co. is working the lower levels. Mr. L. A. Horne is local representative of the company and has charge of the work. The upper workings of the mine are being operated under a lease by a group of miners. The lessees are reported to have opened encouraging showings of silver-lead ore. It may be added that shipments of ore are made occasionally to Trail, where 422 tons of St. Eugene ore was received during the first half of the current year and 278 tons to October 7th of the current half; together 700 tons. Other mining properties in the neighborhood of Moyie on which work is being done are the Empire, situated east of the Society Girl group, with five men employed, and the Guindon, on the west side of Moyie lake, where some concentrating ore is being opened in the lower levels. In other parts of East Kootenay metalliferous mining is also being done, but the Sullivan mine continues to be the only large producer; its quarterly totals of ore production this year have been, for the quarter ended March 31st, 16,497 tons; June 30th, 19,941 tons; September 30th, 29,307 tons; total for nine months, 65,745 tons.

### West Kootenay.

**Ainsworth.**—A highly colored account of a reported important strike of ore in the Gallagher mine was quite recently published in a Spokane, Washington, newspaper. While years ago a considerable quantity of high-grade ore was shipped from this property, its production has been very small in late years. The record of ore receipts at the Trail smeltery show that in 1916, to October 7th, 41 tons had been received from the Gallagher, and in 1915 only 15 tons, while none at all appeared in the receipts figures for 1914. It is not at all improbable that with sufficient money available for considerable development the Gallagher may be made an important producer, but those responsible for the published statements now being referred to appear to be suggesting advantages that it is doubtful if the property possesses. For instance, there is the statement that "the Gallagher is surrounded by the Highland No. 1, and Silver Hoard and is a mile from the Florence." Now it is a very long mile from any one of those four mines to the Gallagher. Probably the reason the Highland and No. 1 were mentioned in this connection was that they have been the only considerable producers in the camp in 1915 and 1916.

Another objectionable movement in Spokane is the lately announced organization of the Leo Mining Co., "capitalized for 1,000,000 shares at 5 cents, of which 200,000 shares are to be held in the treasury." If this means that the promoters hold four-fifths of the shares the opinion may be expressed that anyone foolish enough to buy treasury shares at five cents while the promoters have so large a proportion of the total number of shares which it might suit them to sell at one cent a share, or even one-tenth of a cent, deserves to lose his money. Again, reference is made in connection with this promotion that "north of the property of the Leo company is the Banker mine, being worked by the Consolidated Mining and Smelting Co. of Canada. On the Highlander, adjoining on the south $200,000 worth of work has been done. Other highly developed properties lie on the south and west." It is true that in 1914 the Consolidated Co. shipped 703 tons of ore from the Banker and Maestro properties, but for two years following the outbreak of the European war no work has been done on either. Nor has anything been done on the Highlander for years. Here again the names of well known mines have been used seemingly to mislead. Many productive mines in West Kootenay are being worked by Spokane operators, some of them with considerable profit to those who have been enterprising enough to finance their development and equipment, and the province can well do with much more of that desirable and needed class of support to its mining industry, but there are, unfortunately, other kinds, of which the less there is the better for legitimate mining.

**Slocan.**—The total quantity of ore received at Trail from mines in Slocan division during nine months ended September 30th, 1916, was 12,240 tons for the corresponding period of 1915 it was 8,356 tons. The increase has been, therefore, nearly 50 per cent. Last year 16 mines, big and little, were on the shipping list; this year, there are 21. Seven properties on last year's list, with a total production, to September 30th, of 140 tons of ore, have not been producers this year; on the

other hand there are twelve on this year's list that were not producers last year, and these have produced 2,293 tons of ore. These figures take into account only those that have shipped to Trail, so do not include shippers of zinc ore, nor one mine that in 1915 also shipped silver-lead ore to the United States. The larger shippers to Trail this year have been the Standard 5,394 tons, Rambler-Cariboo 1,457 tons, and Galena Farm 1,234 tons; other shippers of more than 100 tons are the Slocan Star 890 tons, Ruth-Hope 618 tons, Lucky Thought 488 tons, Hewitt 334 tons, Wonderful 279 tons, Lucky Jim (zinc) 193 tons, Idaho-Alamo 181 tons, and Noonday 121 tons.

Late news from mines in Slocan division includes the following: The strike of ore in the Alpha property of the Standard Silver-Lead Co. is reported to be quite important; also that silver-lead ore has been cut in opening from one of the lower tunnels. Net profits on operations at the Galena Farm mine, near Silverton, are stated to have been about $22,000 for September, bringing the total for five months, May-September, up to more than $150,000. In one of the Noonday adits, at about 1,000 ft. from its portal, a shoot of ore 3 ft. wide has been cut, and arrangements have been made for hauling ore about two miles to the railway terminus in Sandon. The Surprise concentrating mill is expected to soon be in operation, its equipment being nearly completed. About 70 tons of ore a day has been concentrated at the Slocan Star; when the new plant being added and the greater water power being provided shall be available, which it is expected will be before the winter shall set in, the output will be increased to more than twice as much as that now being made. The finding of a shoot of zinc ore in workings from No. 5 level of the Lucky Jim mine is reported; it is thought this will prove to be the downward continuation of the big shoot of ore opened from No. 4 about 360 ft. above. Shipment of ore from the Queen Bess mine has been resumed, after the mine had been closed for several years. The Slocan Sovereign, above Cody, will shortly be sending ore down to the railway at Sandon, the work of getting the trail in order for hauling or rawhiding having been taken in hand. Generally, there is much activity in mining throughout the district.

In Slocan City mining division there have been four mines shipping ore to Trail this year, namely, the Black Prince, Enterprise, Ottawa and Meteor. Total of production to October 7th is 319 tons, chiefly of ore having a comparatively high silver content.

**Nelson.**—Ore shipments to Trail from mines in this division during the quarter ended September 30th totalled 1,499 tons, which was nearly as much as during the six months ended June 30th. For the quarter ended March 31st the total was 708 tons, and for that ended June 30th 795 tons. The increase in the third quarter was made chiefly by the Emerald lead mine, near Salmo, and the Eureka copper mine, at the head of Eagle creek, near the city of Nelson. Of the total of 3,002 tons for the nine expired months, 1,227 tons was from the Eureka and 943 tons from the Emerald. Gold concentrates from the Queen stamp mill on Sheep creek totalled 292 tons, and from the Granite-Poorman mill near Nelson 160 tons. The Molly Gibson, above Kokanee creek, shipped 186 tons of silver-lead ore, and the Hudson Bay, near Salmo, 112 tons of lead and zinc ores. The remaining 82 tons consisted of gold ores from three small properties.

A Nelson syndicate has bonded the Spokane group, in the Bayonne region east of Sheep Creek camp, from which 30 tons of ore shipped to Trail in August is stated to have given net returns from the smeltery of about $100 a ton, the valuable contents having been silver, lead and gold. A trail down to Kootenay lake is being made, to allow of rawhiding ore to the lake side during the coming winter. Development work on the property includes two adits.

**Rossland and Trail.**—Ore shipments to Trail from Rossland mines during nine months ended September 30th, totalled 249,910 tons, as compared with 255,024 tons for the corresponding period of 1915. The small decrease this year was the result of an insufficient supply of coke at Trail, which necessitated a curtailment of Rossland ores in the latter part of the last quarter and a consequent reduction in output at the Consolidated Company's mines at Rossland. Comparative figures of production, those in parentheses being for the 1915 period, are as follows: Centre Star, 138,986 tons (139,255 tons), Le Roi, 98,300 tons (102,455 tons); Le Roi No. 2 Co.'s Josie group, 12,553 tons (13,297 tons); miscellaneous, 71 tons (17 tons); total, 249,910 tons (255,024 tons).

It has been announced that shipment of electrolytically refined copper from the Consolidated Mining and Smelting Company of Canada's smelting and refining works at Trail will shortly be commenced. The production of refined copper has been in progress at the company's new electrolytic refinery for several weeks, but the furnace for melting the copper after it comes from the electrolytic tanks was not completed by the end of September, so shipment of copper has had to await its completion. Much structural steel, for enlargement of the electrolytic zinc refinery at Trail is being received, and erected; meanwhile the output of electrolytically refined zinc is about 20 tons a day.

### General Notes.

A bar of gold weighing 17 lb. has been received at the Bank of British North America, Ashcroft, from the Lorne mine, in Lillooet district. This was the third lot of gold sent out from the mine in two months.

The Highland Valley Co. has received about $1,100 as the net returns from 31 tons of ore shipped from its mine in Ashcroft mining division. Mr. Rowland King, who is to have charge of the company's newly erected concentrator, arrived in Ashcroft late in September.

Mr. F. W. Holler, superintendent of the Surf Inlet gold mines, on Princess Royal island, for the Tonopah-Belmont Development Co., when in Prince Rupert at the end of September, stated that the prospects for the mine are better-looking as development work is advanced. The dam for water supply purposes has been finished and erection of buildings for housing the company's workmen is in progress.

A report, published in a Prince Rupert newspaper, is that on one property on Manson creek, Omineca, $2,200 worth of gold was taken out in 18 days after tunnelling 760 ft. to reach the old channel in which the gold was found.

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The British Columbia Copper Co. is developing under option of purchase, the Cariboo mineral claim, situated about four miles northeast of Chesaw, in the northern part of the State of Washington and within 20 miles of the company's smelting works at Greenwood, B.C. It is stated that about 40 ft. of copper ore of good grade has been opened.

## SILVER CUPS FOR COMPETITIONS IN FIRST AID

The British Columbia Department of Mines has provided four handsome silver cups for annual competition in first aid work by teams of miners, one each for four districts in that Province, namely: (1) Vancouver island and the Coast, (2) Nicola and Similkameen, (3) Boundary and West Kootenay, and (4) East Kootenay. For the present, competitions in three of these districts are likely to be restricted to coal miners, since few, if any, first-aid teams have yet been organized in them by metal miners. In the other district, that of Boundary and West Kootenay, there are not any coal miners, but there are teams of metal miners.

The rules under which the competitions for these cups are to be conducted have been formulated by the Chief Inspector of Mines for the Department, as follows:

1. Competitions for the cups shall be open to all mining employees in and about the coal and metalliferous mines of British Columbia. Should the cup for any district not be competed for two years in succession, the Department of Mines reserves the right to remove the cup from that district and place it for competition in some other district.

2. The cup shall be open for annual competition, at a place to be designated by the District Committee.

3. Competitions for the cup shall be in a team event consisting of not less than five persons, including a patient.

4. Every member of a team contesting, including the patient, shall be the holder of a First Aid Certificate of Competency from the St. John or other recognized Ambulance Association, and may be either a surface or an underground employee. No physician nor professional nurse shall be eligible to compete.

5. No official of the British Columbia Department of Mines shall be eligible to act as a judge in any competition for a cup.

6. The method of discounting in any competition shall be the standard adopted by the Department of Mines. Discount cards will be provided.

**Competition at Nanaimo.**—The first competition for the Vancouver island-Coast cup took place at Nanaimo, Vancouver island, on Labor Day, September 4th, under the auspices of the Vancouver Island Mine Safety Association, organized last spring. There was also a competition for the Coulson cup, presented to the St. John Ambulance Association several years ago by Mr. W. L. Coulson, then general manager for the Canadian Collieries (Dunsmuir), Ltd., on behalf of the company, for competition annually by teams of miners or other mine employees. There were eight teams competed. Three teams came from the Canadian Collieries Co.'s Extension colliery and one team from that company's Bevan mine, Comox; the Western Fuel Co.'s mines sent two teams, one from its No. 1 shaft mine at Nanaimo, and the other from Protection Island mine; the Pacific Coast Coal Mines, Ltd., was represented by a team from its South Wellington mine, and the Vancouver-Nanaimo Coal Co. by a team from its mine at East Wellington. The judges in the competitions, which were held on the Cricket Ground, Nanaimo, in the presence of about 500 spectators, were Dr. W. E. Wilks, of Nanaimo, Dr. W. F. Luton, of Ladysmith, and Dr. P. E. Emerson, of Extension. Mr. Dudley Michell, Instructor of First Aid and Mine Rescue work for the Department of Mines, attended on behalf of the department. The results of the competitions were as under:

**For Department of Mines Cup.**

| Name of Team. | Percentage of Points. |
|---|---|
| East Wellington | 97 |
| Extension No. 2 | 95 |
| Extension, surface men | 94 |
| Protection Island | 93 |
| Bevan | 93 |
| Extension No. 1 | 92 |
| No. 1 Shaft | 91 |
| South Wellington | 90 |

**For Coulson Cup.**

| Name of Team. | Percentage of Points. |
|---|---|
| Extension, surface men | 97 |
| Bevan | 95 |
| East Wellington | 95 |
| Extension No. 1 | 94 |
| Extension No. 2 | 94 |
| Protection Island | 93 |
| South Wellington | 92 |
| No. 1 Shaft | 90 |

Besides winning the Department of Mines cup, the East Wellington (Vancouver-Nanaimo Coal Co.) team won the five gold medals donated by the association; the Extension No. 2, who came second, won the five silver medals donated by Mr. T. R. Stockett, general manager for the Western Fuel Co.

In the evening there was a banquet and musical entertainment, during which the prizes were presented to those winning them, and addresses were delivered by Messrs. J. H. Cunningham, Michell, and Fulton, the last mentioned representing the St. John Ambulance Association.

**Competition at Rossland.**—Arrangements are being made to hold a competition for the Boundary-West Kootenay district cup at Rossland on Friday, October 27th, when it is expected three or four teams from Rossland gold-copper mines will compete. It is not yet known whether any other part of those districts will send a team or teams, but it is hoped that one or two of the big copper mines in Boundary district will be represented in the competition, which will be the first to be held, open to teams from any part of those extensive metalliferous mining areas.

## OBITUARY.

A press despatch from Seattle, Washington, dated August 31, stated that "Skookum Jim Mason, the Indian, who, with George Marmack of Seattle, discovered the Klondike gold field 20 years ago, died recently at Carcross, Yukon territory. At one time he had $100,000 in gold, nearly all of which he squandered. On a visit to Seattle he threw money from his hotel window to see crowds fight for it in the street below."

The tragic death of Mr. Joseph Despard Pemberton, of Victoria, B.C., a well-known engineer and surveyor, who during a number of years of professional work had done much surveying in mining districts of the Province, was thus reported by the Victoria Daily Times: "The late J. D. Pemberton left Victoria last Tuesday afternoon, August 29, accompanied by W. F. Ferrier, of Toronto; and by H. M. Lewis, of this city, making the trip to Shawnigan Lake by motor. The party intended visiting some mining interests in the San Juan River country, and about 11 o'clock the next morning, after spending the night at the Strathcona Lodge, started out with pack-horses and the necessary supplies and provisions to last them for a couple of days. About 7.30 in the evening, after spending the whole day on the trail, the party had fixed on camping at

a certain point. Within five minutes or so of reaching this place Mr. Pemberton complained of cramp in the knees and sat down to rest, asking his two companions to lead his horse and proceed without him. As he did not arrive as quickly as they expected Mr. Ferrier and Mr. Lewis went back, after unsaddling their horses, and found him by the wayside, he apparently having never risen from the position where they left him. The body was taken down to Victoria on Sept. 1." The late Mr. Pemberton was born in London, England, about 43 years ago. His father was Surveyor-General for British Columbia, and the family has long been one of the oldest and best known in the southern part of Vancouver Island, where members of it have large property interests. Mr. Pemberton, Sr., died many years ago, but it was only last month that his widow—long actively associated with philanthropic and charitable work in the capital city of British Columbia—passed to her rest.

## BRITISH COLUMBIA COPPER CO.'S OPERATIONS.

Mr. Oscar Lachmund, of Greenwood, Boundary district of British Columbia, general manager for the British Columbia Copper Co., is reported to have given the following information concerning the operations of the company when in Spokane, Washington, at the end of August:

"The results obtained by previous diamond drilling in the company's mining properties on Copper Mountain, Similkameen district of British Columbia, have been fully verified by the disclosures made by our main tunnel in the first orebody it encountered. The tunnel, which is now more than 1,000 ft. long, crosscut one end of the orebody; and a drift is now being run in the ore, while the tunnel itself is being driven ahead at the rate of 20 ft. daily, except when timbering is necessary on account of the softness of the ground. The tunnel is 9 by 10 ft. in the clear and is designed to open the company's ground to what will be known as the glory-hole level, it being the intention to mine out on the glory-hole system all ore above that level.

"We are now installing a pumping plant to elevate water from the Similkameen River to a distributing point 1,700 ft. above the river, through a pipe line 6,000 ft. in length. The pumping equipment will consist of Gould triplex pumps, and the pipe line will be composed of 4-in. high pressure hydraulic pipe in the lower section and steel pipe of 6 in. in diameter at the discharge. The water will be used to supply the mine, the camp and a 50-ton experimental mill. The mill will be devoted to the working out of a concentration process preliminary to the erection of a 2,000-ton plant on the Similkameen River. If we are not delayed by railway troubles in the delivery of our machinery and pipe, we shall have the pumping installation completed before winter shall set in.

"The coke supply for the company's smelting works at Greenwood has been causing us a lot of worry. It is still so inadequate that we are compelled to draw continuously upon the stock pile which we like to keep in reserve at all times. We have obtained some 1,700 tons of coke from the Coast, but deliveries from that source are no longer to be depended upon, and in any event the cost is burdensome.

"As the failure of the Crow's Nest district coal producers to supply us adequately with coke is due solely to a shortage of labor, we are urging the Government to relieve the situation either by releasing such of the interned aliens as are willing to work or by suspending temporarily the law which prevents us from importing laborers from the United States.

"Besides ore from the company's own mines in British Columbia and Washington, we are smelting the entire output of the Intermountain Copper Co. in Montana, the Empire Copper Co. in Idaho, and the Iron Mask mine near Kamloops, B.C.

## ZINC SMELTING.

Boston, Oct. 23.—When present construction work for increasing zinc smelting capacity in England has been completed, that country will be able to produce spelter at the rate of 85,000 tons, or 170,000,000 pounds per annum. This will represent an increase of 100 per cent. over two years ago.

Despite the fact that Englishmen controlled the large zinc mines of Australia, there was never any attempt made to smelt this product in Great Britain. This was left for German metal firms to handle in their smelters in Germany and Belgium. The war has altered that position and long-time contracts between the Australian mines and the Germans have been annulled.

The major portion of the Australian zinc output has been going to the United States smelters since the middle of 1914 while there have also been increasingly large shipments to Japan.

## TORONTO MARKETS.

Cobalt oxide, black, $1.05 per lb.
Cobalt oxide, grey, $1.15 per lb.
Cobalt metal, $1.25 to $1.50 per lb.
Cobalt anodes, $1.50 to $1.75 per lb.
Nickel metal, 45 to 50 cents per lb.
White arsenic, 5½ to 6 cents per lb.

Oct. 24—(Quotations from Canada Metal Co., Toronto)—
Spelter, 15 cents per lb.
Lead, 9 cents per lb.
Tin, 45 cents per lb.
Antimony, 18 cents per lb.
Copper, casting, 29 cents per lb.
Electrolytic, 31½ cents per lb.
Ingot brass, yellow, 17½ cents; red, 20½ cents per lb.

Oct. 24—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $8.50 per ton.
Coal, bituminous, $6.00 per ton.

## SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| October 6th | 68¼ | 32½ |
| " 7th | 68¼ | 32½ |
| " 9th | 67⅛ | 32⅛ |
| " 10th | 67½ | 32 5/16 |
| " 11th | 67⅝ | 32⅜ |
| " 13th | 67⅞ | 32 7/16 |
| " 17th | 67¾ | 32 5/16 |
| " 18th | 67¾ | 32 5/16 |
| " 19th | 67¾ | 32 5/16 |

## MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% $MoS_2$, $13.00 per unit.
Ores carrying between 3% and 5% $MoS_2$, $14.50 per unit.
Ores carrying between 5% and 10% $MoS_2$, $16.00 per unit.
Ores carrying between 10% and 15% $MoS_2$, $17.00 per unit.
Ores carrying between 15% and 20% $MoS_2$, $18.00 per unit.
80% concentrates $1.00 lb. of $MoS_2$.
Penalties imposed for copper and bismuth.

# MARKETS

## NEW YORK MARKETS.

Oct. 31, 1916—Connellsville Coke—
Furnace, spot, $5.25.
Furnace, contract, $3.75.
Foundry, prompt, $5.00 to $5.25.
Foundry, contract (nominal), $3.50 to $3.75.
Straits tin, f.o.b., 41 cents.
Copper—
Prime Lake, nominal, 28.25 to 28.50 cents.
Electrolytic, nominal, 28.50 to 28.75 cents.
Casting, nominal, 27.12½ to 27.37½ cents.
Lead, Trust price, 7 cents.
Lead, outside, 7 to 7.12½ cents.
Spelter, prompt western shipment, nominal, 9.67½ to 9.80 cents.
Antimony—
Chinese and Japanese, 13.00 to 13.25 cents.
American, nominal.
Aluminum—nominal—
No. 1 Virgin, 98-99 per cent., 64 to 66 cents.
Pure, 98-99 per cent. remelt, 59 to 61 cents.
No. 12 alloy remelt, 47 to 49 cents.
Powdered aluminum, $1.00 to $1.15.
Metallic magnesium, 99 per cent. plus, $3.50.
Nickel—
Shot and ingot, 45 cents.
Electrolytic, 50 cents.
Cadmium, nominal, $1.45 to $1.50.
Quicksilver, $80.
Platinum, $90.
Cobalt (metallic), $1.25.
Silver (official), 67¾ cents.

Metal Products—Following base prices represent the outside market except where otherwise specified and are entirely nominal except in the case of lead sheets and sheet zinc:

Sheet copper—
Hot rolled (f.o.b. mills), 37.5 cents.
Cold rolled (f.o.b. mill), 38.5 cents.
Copper in rods, 43 cents.
Copper in rolls, 40 cents.
Copper wire (f.o.b. mill), 33 cents.
Copper wire (f.o.b. mill), November, 32.25 cents.
High brass—
Sheets, 42 to 46 cents.
Wire and light rods, 45 to 48 cents.
Heavy rods, 41 to 45 cents.
Tubing—
Brazed brass, 45 to 50 cents.
Brazed brass (f.o.b. mill), 43.75 cents.
Seamless copper, 47 to 49 cents.
Seamless brass (f.o.b. mill), 46 to 48 cents.
Naval bronze—
Rods (f.o.b. mill), 40 cents.
Sheets (f.o.b. mill), 41.50 cents.
Muntz metal—
Rods, 38.5 cents.
Rods (f.o.b. mill), 36.5 cents.
Sheets, 42 cents.
Sheets (f.o.b. mill), 40 cents.
Full lead sheets (f.o.b. mill), 8.5 cents.
Cut lead sheets (f.o.b. mill), 8.75 cents.
Sheet zinc (f.o.b. mill), 15 cents.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)
As of close October 23rd, 1916.

### New York Stocks.

| | Bid. | Asked. |
|---|---|---|
| Can. Copper | 2.12 | 2.38 |
| Canada Cement | 69.00 | 69.25 |
| Howe Sound | 5.50 | 5.75 |
| International Nickel (new) | 51.75 | 51.87 |
| Midvale Steel | 67.87 | 68.00 |
| Marconi | 3.00 | 3.25 |
| Steel of Canada | 64.50 | 64.75 |
| Standard Shipbuilding | 10.00 | 14.00 |
| Submarine Boat | 44.50 | 42.00 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex | .08¾ | .08⅝ |
| Davidson | .50 | .50½ |
| Dome Consolidated | .09½ | .11 |
| Dome Extension | .33 | .33½ |
| Dome Lake | .60½ | .61 |
| Dome Mines | ... | 26.10 |
| Foley O'Brien | .70 | .81 |
| Gold Reef | .01 | .01¼ |
| Hollinger | 6.70 | 7.00 |
| Homestakes | .61 | ... |
| Jupiter | .28 | .29 |
| McIntyre | 1.56 | 1.57 |
| McIntyre Extension | .44 | .45 |
| Moneta | .15 | .16 |
| Porcupine Crown | .71 | .72 |
| Porcupine Imperial | .03⅞ | .04 |
| Porcupine Tisdale | ... | .01¼ |
| Porcupine Vipond | .35 | .35½ |
| Preston East Dome | .04 | .04½ |
| Vacuum Gas and Oil | .59 | .60 |
| New Ray | .75 | .80 |
| Teck Hughes | .39 | .41 |
| West Dome | .34¼ | .34½ |
| Bonanza Mines | .15 | .15½ |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac | .31½ | .32½ |
| Bailey | .07½ | .08 |
| Beaver | .40½ | .41 |
| Chambers Ferland | .17 | .18 |
| Coniagas | 4.75 | 5.20 |
| Crown Reserve | .51 | .51½ |
| Foster | ... | .07 |
| Gifford | .04 | .05 |
| Great Northern | .08 | .08¼ |
| Hargreaves | .03 | .03½ |
| Hudson Bay | 70.00 | 75.00 |
| Kerr Lake | 4.75 | 4.87½ |
| La Rose | .60 | .62 |
| McKinley | .60 | .62 |
| Nipissing | 8.55 | 8.60 |
| Ophir | .09 | .10¼ |
| Peterson Lake | .20¾ | .21 |
| Right of Way | .05 | .06 |
| Seneca Superior | .09 | .10 |
| Shamrock Cons. | .14½ | .15 |
| Silver Leaf | .01½ | .02 |
| Temiskaming | .61½ | .62½ |
| Trethewey | ... | .19 |
| York Ontario | .01 | .01½ |
| Wettlaufer | .10 | .10½ |

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 5
Armstrong, Whitworth of Can., Ltd. . . . . 10

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
Beatty, M. & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
Berger, C. L. & Sons . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd. . . . . 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co. . . . . 6
Canadian Explosives, Ltd. . . . . 14
Can. Ingersoll-Rand Co., Ltd. . . . . 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. . . . . 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . .Outside Back Cover

D

Dept. of Mines, Canada. . . . . .Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd. . . . . 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7
Darling Bros. . . . . 9

E

Escher, Wyss & Co. . . . . 4

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fuller, A. S. & Co. . . . . 12

H

Hassan, A. A. . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11

I

Imperial Bank of Canada . . . . . 6
Industrial & Technical Press. . . . . outside back cover
International Molybdenum Co. .. 6
International Nickel Co. . . . . 6

J

Johnson, Matthey & Co. . . . . 11

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

Murphy, Chas. J. . . . . 11
Mussens, Ltd. . . . . 10

N

Nova Scotia Steel & Coal Co.... 4
Nova Scotia, Province of. . . . . 8
Northern Canada Supply Co., Ltd. 7

O

Ontario, Province of . . . . . .Inside Back Cover

Q

Quebec, Province of . . . . . 8

S

School of Mining . . . . . 5
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 11
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2
Standard Underground Cable. Co. of Canada . . . . . 9

T

Tyrrell, J. B. . . . . 11

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Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

## GEOLOGICAL SURVEY

### Recent Publications

Summary Report of the Geological Survey for the Calendar Year 1915.

Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 78. Wabana Iron Ore of Newfoundland, by A. O. Hayes.

Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Map 59A. Wheaton, Yukon Territory.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 160A. Manaimo Sheet, Vancouver Island.

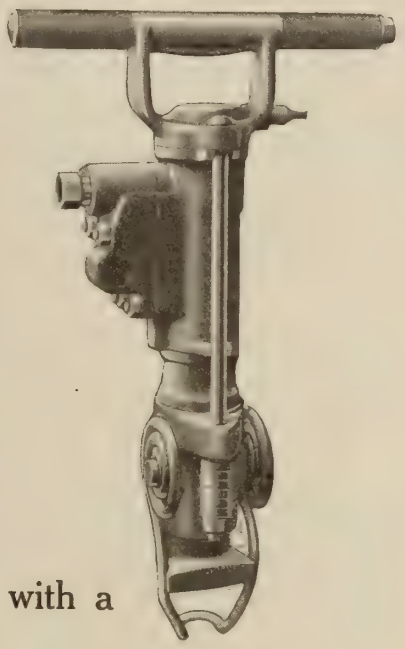
Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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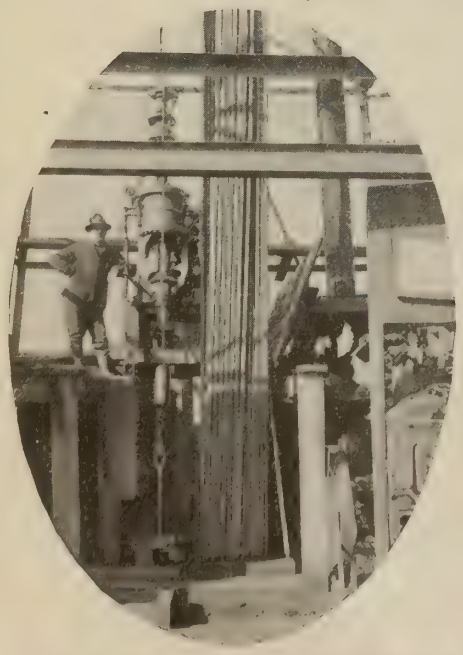
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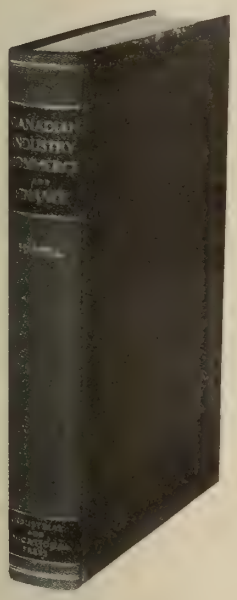
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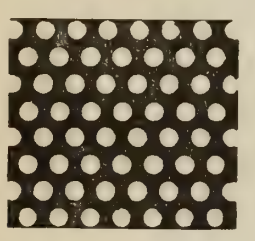
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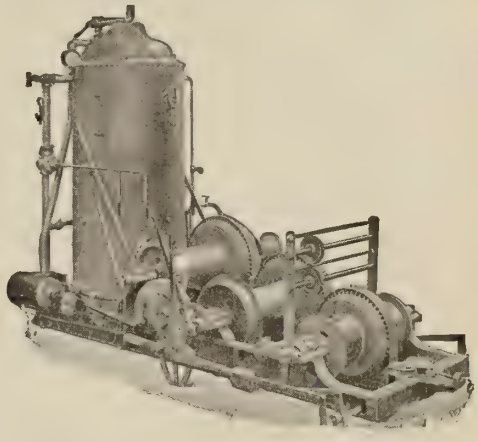
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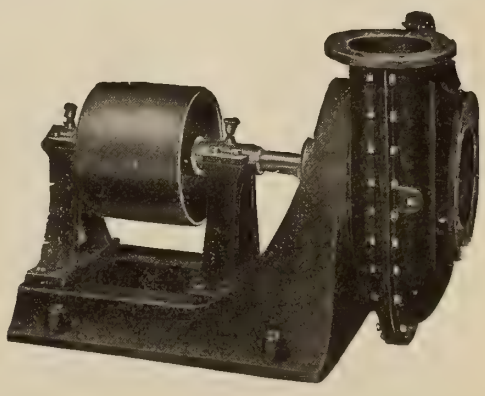
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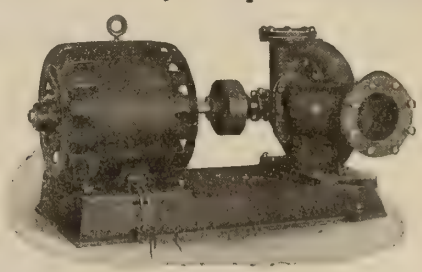
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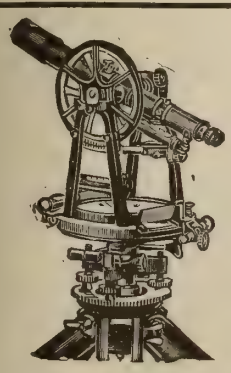


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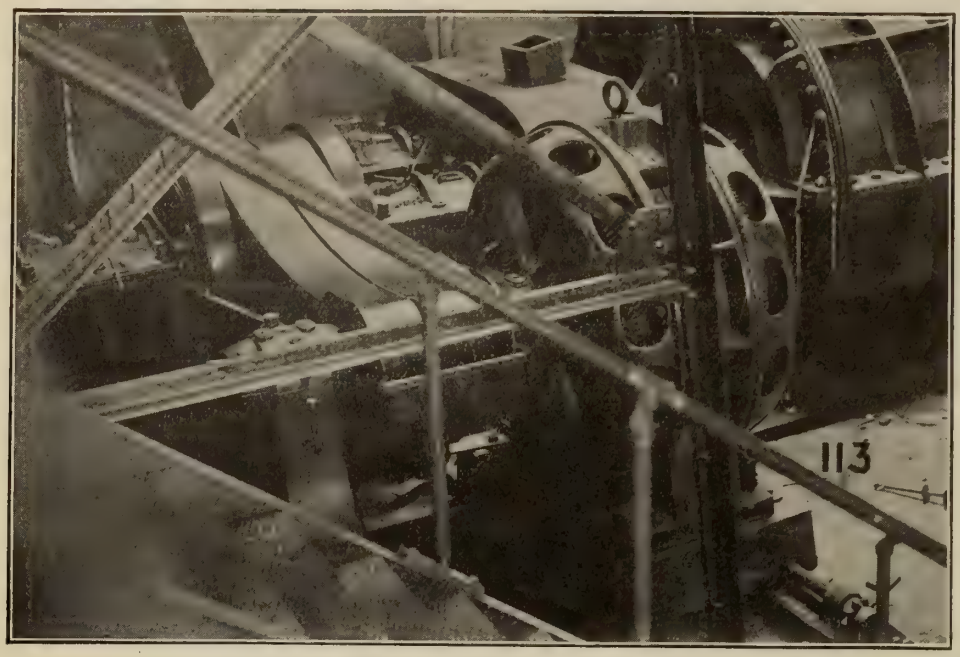


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# THE CANADIAN MINING JOURNAL

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CONTENTS

| Editorial— | Page |
|---|---|
| Industrial Management | 527 |
| On the Possibility of Producing Refined Copper in Canada, by A. W. G. Wilson | 529 |
| Gold Dredging in Yukon | 535 |
| Increase in Wages of Dominion Steel Co.'s Employees | 546 |
| Refining Zinc and Copper at Trail | 547 |
| Personal | 548 |
| Markets | 549 |

## INDUSTRIAL MANAGEMENT

In the November number of "The Engineering Magazine," the editor, Mr. John R. Dunlap, has some timely remarks on Industrial Management. In view of the fact that Canadian industrial concerns are now called upon to increase output in spite of a scarcity of labor, Mr. Dunlap's comments are especially worthy of attention. He says:

"High wages, shorter hours, increasing labor unrest, the growing shortage of labor in every field of industry, and the enormous increases in the cost of all the staples of manufacture—these are conditions which have finally brought home to all thinking men the pressing importance of now intently studying every possible means of decreasing the costs of production.

"Great captains of industry, like Andrew Carnegie, Charles M. Schwab and Henry Ford, long ago recognized and acted upon the knowledge that this is a mechanical age, that all the secrets of cheap production are to be found in the utilization of mechanical power, that automatic and semi-automatic machinery must be operated by skilled mechanics at high wages, and that standardized production, the largest possible output, and especially continuous operation, offer the only possible solutions of the problems which confront all industrial managers.

"Knowing, also, that engineers and inventors are the men who have revolutionized industry, annihilated distance, made the world a neighborhood, and enormously increased the production of actual wealth, the undeviating policy of all these great industrial leaders has been to surround themselves with, and make partners of, engineers, inventors, superintendents, managers, and salesmen who have distinguished themselves by great constructive and productive achievements. As a sequence, for a generation past the vast mechanical plants erected and operated by these men, under such leadership, have been the marvels and models of this mechanical age. And it is in these wonderful mechanical plants, operated by highly trained engineers and skilled mechanics at high wages, that the cheapest products in all the world's markets have been produced. Andrew Carnegie has said that it is not the lowest, but the highest-paid labor, with scientific management and machinery, which gives cheapest products.

"Just here it is fundamentally important to remind responsible industrial leaders that Mr. Carnegie has always boasted with great pride that he valued his organization, his partners, his engineers and his managers, far more highly than he valued his plants, and if he had to lose either, he would much prefer to lose his plants—because they could be replaced much more quickly than his organization!

"Now that the world war has flooded our markets with orders of every description now that the productive capacity of all our industries is taxed to the limit; now that the great steel industries, the munition manufacturers, the automobile manufacturers, and indeed employers of every kind are paying wages unheard of before, it becomes plainly evident that the

labor question has become the paramount problem before every American manufacturer, great or small.

"In other words, we are now face to face with the Human Problem—we must recognize and promptly act upon the obvious fact that the welfare, the contentment, the good-will, and the physical fitness of the men and women who operate our industrial plants are matters of first and immediate concern to all employers; and that henceforth the management, training, reward, and inspiration of the workers must be studied practically and scientifically, precisely as we have long studied and perfected the machinery of production.

"Conservative, hard-headed, and successful employers of the old school, who believe in "driving" operatives rather than leading them, may be affrighted by the high wages now current and the danger of "labor domination," and they may stand aghast at the thought of abandoning the ten hour or the nine hour day; but these are problems simple enough to enlightened employers who have seriously studied the literature and actually viewed the practice of the new Science of Industrial Management. Not a problem confronting industrial America to-day—be it wages, hours, unions, open-shop, piece-rates, premium, bonus, welfare work or what not—but has been successfully solved in hundreds of cases and in every field of industry."

Mr. Dunlap suggests a way out of a difficulty that is confronting us. He believes that "industrial economy must be studied as a practical science, because it is the very basis of successful industrial administration."

Predictions are being freely made these days that the increasing cost of labor will eventually result in impossible operating conditions throughout North America. It is often stated that laborers are becoming used to more extravagant methods of living because of the temporary higher wages and that after the war it will be impossible to compete with the cheaper labor of Europe. Those who make such predictions believe that there must result a complete disruption of industry caused by the demand for higher wages than the industries can afford to pay. Such disruption would be accompanied by a period of hard times for employer and employee alike and followed by a reconstruction period when the employee is ready to work for lower wages. Mr. Dunlap seems rather to incline to the belief that efficiency can be so increased as to solve the problem.

Anyone familiar with the mining industry knows that efficiency has been greatly increased in the past few years. They know also that it will be increased much more by better methods, better machines and especially by better men. It is to be hoped that there will be no necessity of discontinuing operations because of the high wages demanded by workers. At present the good prices being received for mine products, the scarcity of labor and the high cost of living make high wages reasonable. Increased efficiency may make it possible to continue paying high wages when conditions would otherwise not warrant it.

Just now it is necessary to pay high wages to men who are efficient workers. The scarcity of labor is serious not only in Canada but in the United States, and employers find it necessary to keep men who cannot or will not do a good day's work. There is no compensating advantage for the higher wages being paid. The work done per man per day will not compare favorably with that before the war. Many of the best men are in the army.

Mine managers are now confronted with the problem of maintaining production with a smaller and less efficient force of men. They are naturally devoting a good deal of attention to the problem. The history of mining leads us to expect that they will succeed. In their efforts the managers will have the co-operation of the manufacturers of mining machinery, who are at present themselves confronted with many difficulties.

## NOVA SCOTIA STEEL.

After a meeting of the board of directors of the Nova Scotia Steel and Coal Company, held in Montreal on Monday afternoon, Col. Thomas Cantley stated that despite the labor shortage and other difficulties, the company's output for the first nine months of 1916 was 40 p.c. greater than at any previous time. The company is booked practically to capacity operations until midsummer next. Business has been offered for the second half of 1917, but the management is not anxious to hasten the acceptance of contracts further ahead than the first six months of the new year. Col. Cantley declined to discuss the question of dividends on the common stock.

At the board meeting, the directors decided to enlarge the company's shipbuilding activities, by building a second ocean-going vessel, and one about 25 p.c. larger than the first now under construction, and which will be ready for launching in the spring.

## DOME.

Dome made a new record in October, milling 40.200 tons, yielding $185,000. The war tax for the fiscal year has been fixed at $27,502.

## HOLLINGER.

Hollinger in the four weeks ending October 6th, milled 49,770 tons ore, yielding $433,693. The gross profit for the four-week period was $241,293. The war tax for the year has not been definitely settled, but will be not a serious burden if expectations prove correct.

## APEX.

The Apex company will shortly resume prospecting work on its claims in the Porcupine district. A diamond drill will be operated.

## NEWRAY.

Manager Charlebois reports on the recent discovery at Newray mine, as follows:

"Diamond drill No. 4 is now down 900 feet. Is on angle of 45 degrees. At 630 feet vertically the core shows 12 feet of quartz carrying lots of free gold. This hole cuts the find between the Anchor vein and the Hanson vein. So far this is the biggest find ever made on the Newray."

It is reported also that a new vein has recently been located in the southwest corner of the property, near the Plenaurum line, from which the management announce some very satisfactory assay results have been received.

# ON THE POSSIBILITY OF PRODUCING REFINED COPPER IN CANADA*

By A. W. G. Wilson

### Copper Resources of Canada.

Native copper occurs in Canada in a number of different localities, but in no place within reach of existing lines of transport has exploration work disclosed concentrations of the metal in sufficient quantity to render it practical to operate these deposits commercially by present methods, the copper content of the rock being usually less than one per cent.

Minerals containing copper as an essential constituent occur in many places throughout Canada. Those commercially important are the sulphides; carbonates and oxides also occur, usually in association with sulphide deposits, but they are relatively of minor importance. The two sulphides, Chalcopyrite and bornite, both of which also contain iron, are the most important; locally chalcocite, the pure sulphide, is also occasionally found.

At the present time copper sulphide ores are being mined successfully in the following districts in Canada:

1. **Quebec.**—Eastern Townships in the vicinity of Sherbrooke. The annual production varies, has been increasing in the last few years, and may be taken as about 5,000 000 pounds per annum. The Quebec ores are mined for their contained sulphur and are marketed chiefly in the Eastern United States; the copper recovered is in the nature of a by-product, and is recovered in United States plants after the available sulphur has been extracted.

2. **Ontario.**—Sudbury district. The annual production has been increasing in recent years. In 1914 it was about 29 000,000 pounds and in 1915 it was over 39.000 000 pounds. This copper occurs in association with nickel. Locally the ores are smelted and treated in basic converters producing a matte which contains 80-82 per cent of the combined metals, the balance consisting of iron and sulphur and very small quantities of other metals. The matte containing the two metals is exported to the United States and to England to refineries where the two important constituent metals, and certain included by-products, are recovered separately.

3. **British Columbia.**—There are three principal producing districts.

(a) Kootenays, including Rossland, with a production of 3,780 000 pounds in 1914, and Nelson with a production of 586,700 pounds in 1914. In 1915 the production in this district was slightly more than 5,000,000 pounds. These are both tributary to the smelter of the Consolidated Mining and Smelting Company of Canada at Trail. The Rossland ores are essentially gold ores. They, however, contain a small amount of copper in the form of a sulphide, not much over one-half of one per cent, but sufficient to make it feasible to recover the gold by the methods of the copper smelter.

(b) Boundary. The production in 1914 was about 16,400,000 pounds, and in 1915 it rose to slightly less than 17,700.000 pounds. There are two smelters operating in this district, that at Grand Forks, belonging to the Granby Consolidated Mining, Smelting and Power Company, and that near Greenwood belonging to the British Columbia Copper Company. The mines and smelter belonging to this latter company were closed in August, 1914, at the beginning of the war, but reopened near the end of July, 1915. The mines and smelter of the former company were shut down for a period of 122 days at the close of the year 1914, and afterwards re-opened in January, 1915. It appears probable that the production of this district will gradually decline, unless new deposits are discovered and opened up.

(c) Coast Districts. The production of the British Columbia coast districts in 1914 was about 24.000.000 pounds, while in 1915 it was almost 34,000,000 pounds. At present there are three principal producing centres:

(i.) Britannia Mines on Howe Sound, producing ores and concentrates which are shipped to Tacoma Washington. The normal production is 15-18 million pounds of copper per annum, but it fell below that figure in 1914. When work now under way is completed production will be in the neighborhood of 25,000,000 pounds per annum.

(ii.) Anyox on the Portland canal about 110 miles north of Prince Rupert, at which is located a smelter owned by the Granby Consolidated Mining, Smelting and Power Company. The present capacity of this plant is about 3.000 tons of ore per day. The blister copper produced is shipped to Laurel Hill, New Jersey, for refining. A statement as to the present production is not available, but when the capacity of the plant has been increased, as proposed, to about 4 000 tons per day, the annual production should be in the neighborhood of 40,000 000 pounds of copper.

(iii.) Texada Island has produced a small amount of copper during the last few years, chiefly from the Marble Bay mine. In 1914 the production was 771.000 pounds, which may be considered to be about two thirds normal.

(iv.) Other Localities. A small quantity of copper has been secured, from time to time, from a number of other localities along the coast of British Columbia, or from some of the island adjacent to that coast. Prospecting, exploration, or development work is now in progress in a number of localities and it is probable that new and important discoveries will be made from time to time. One new property east of Prince Rupert and near the main line of the Grand Trunk Pacific railway is now a regular shipper of ore to Anyox.

(d) Similkameen. Extensive explorations in the Similkameen district, not far from Princeton, have been in progress during the last four years. They have shown the existence of large bodies of low grade ores. Preparations are now being made to mine these on a large scale, and to treat them in a concentrating mill. The mill concentrates are to be shipped to the British Columbia Copper Company's smelter at Greenwood, B.C., for treatment.

(4) **Yukon.**—Only one copper mine of importance was operating in Yukon—the Pueblo near Whitehorse. The production from this mine during the last three years has been at the rate of about 1,700,000 pounds per annum. How much ore there is in reserve it is not possible to state. The mine was closed at the beginning of the war, but preparations are now being made to re-open it and it is probable that shipments will be resumed early in the new year. During the period

* Published by permission of the Director of the Mines Branch, Ottawa, from the Summary report of the Branch for 1915 Article written in January, 1916.

it was in operation all the ore produced was shipped to Tacoma, Washington, for treatment.

Summarizing the above statements it will be noted that the annual production of copper from existing mines in Canada was in the neighborhood of 80,000 000 pounds in 1914, a little more than one-third of this being produced in Eastern Canada, and a little less than two-thirds in British Columbia. The total copper recovered from ore produced in Canada in 1914 is estimated by Mr. McLeish, Chief Statistician of the Mines Branch, at 75,738,386 pounds. In 1913 it was 76,976,925 pounds, and in 1915 it is estimated as 102,612,486 pounds.

### Ore Reserves.

With reference to the known ore reserves, upon which future production must depend, there is little accurate information available. It has not been the custom of the operating companies to make public much information with respect to these reserves, even when they themselves possess it. The larger companies all carry exploration and development work in advance of mining and in the majority of cases know that they are assured of ample reserves to keep their present plants in operation for some years to come.

In Quebec the reserves have not been made public, but they are known to be more than enough to insure production at the present rate for more than two years.

In the Sudbury region of Ontario the known reserves are variously stated to be in excess of 100,000,000 tons of ore carrying about 2 per cent copper besides nickel. The operating companies have not made public any official figures with respect to these reserves. An official of the Ontario Bureau of Mines places the known reserves at 71,000,000 tons.

British Columbia is at present the principal copper-producing province of Canada, copper-bearing minerals being found in numerous localities in various parts of the province. The known occurrences are too numerous to be considered individually. The principal producing districts have already been enumerated. Some of the operating companies publish statements of their ore reserves, others do not, and as a consequence it is not possible to make a definite statement as to the tonnage of ore known to be available. A rough estimate, based in part on the published information supplied by certain operating companies, and in part upon rough, and therefore possibly inaccurate, estimates of the ore reserves of other companies, indicates that the known ore deposits of this Province contain in excess of 500,000 tons of recoverable copper equal to twenty years' supply at the present rate of production. In addition to these known ore deposits, which are now being exploited, there is every reason to believe that other equally important discoveries will be made in the future, not only in British Columbia, but also in Yukon.

### Present Methods of Treatment.

1. Quebec ores are nearly all exported to the United States, where the sulphur is first utilized for the manufacture of sulphuric acid and the copper contents of the ores are afterwards recovered at other works.

2. Ontario ores are roasted in open heaps, or in small part in mechanically operated furnaces, to drive off a portion of the sulphur. They are then treated in blast furnaces, or reverberatories, to produce a low grade matte containing the nickel and copper. This matte is further concentrated in basic lined converters until it contains 77-82 per cent. of the combined metals. In this form about 15 per cent of the Ontario production is shipped to Wales, and the balance to the United States for further treatment. A portion of that sent to the United States is again treated to produce the alloy called monel metal, without the separation of the copper from the nickel. The balance of that sent to the United States and all of that sent to Wales is refined by special processes, the copper and the nickel being recovered separately.

3. British Columbia ores are in part sold directly to United States purchasers, and in part given a partial treatment before being shipped to the United States. The smelter at Trail produces a matte containing approximately 42 per cent copper, and a considerable amount of precious metals. This matte is at present being shipped to Tacoma, Washington, for final treatment and refining. I understand that it is the intention of the Consolidated Company to install converters at Trail and to produce Bessemer cakes. This copper will contain an unusual amount of the precious metals, owing to the nature of the Rossland ores, and it will probably be necessary to refine it on the spot. Preparations are being made with this object in view, and it is stated that the refinery will have a capacity of 15 tons of refined copper per day.

(Since Dr. Wilson's report was written, the production of refined copper has been begun at Trail.—Ed.)

The ores from the Boundary district are treated at Grand Forks and at Greenwood, both plants using blast furnaces in which a low grade matte is produced, and afterwards treating this matte in converters to produce Bessemer cakes. This copper which contains 96-98 per cent pure metal is shipped to United States points for refining. The plant at Greenwood was idle during the early part of the year, but has resumed operations.

The ores mined at Anyox, north of Prince Rupert, are treated in blast furnaces, the resultant matte being blown to Bessemer copper in basic converters. The copper is shipped to Laurel Hill, New Jersey, for refining. A small amount of custom ores from outlying points is also treated at Anyox.

The ores mined at Britannia are concentrated in a special plant at Britannia Beach, and then are shipped to the smelter at Tacoma for final treatment. Ore from the Marble Bay mine on Texada Island, and that from the Pueblo mine in Yukon is also shipped directly to Tacoma for treatment.

4. Summary.—The foregoing paragraphs may be summarized by stating that all the copper obtained from ores mined in Canada is recovered in refineries located outside Canada, and chiefly in the United States. About ninety per cent of the copper produced in Eastern Canada is converted into a high grade matte before shipment; about sixty-six per cent of the copper produced in British Columbia is converted into Bessemer copper before shipment, and in all about twenty five per cent of the copper ores mined in Canada is shipped directly to United States points for metallurgical treatment.

### Refining of Copper in Canada.

1. Present Conditions.—Canada refines very little copper at the present time. About one-half of her annual output of copper is treated in blast furnaces and afterwards in converters, and is exported in the form of Bessemer copper, containing usually 95-98 per cent copper, a few ounces of gold and silver per ton, and some impurities. About one-third of her output is exported in the form of matte, either high grade and associated with nickel, as from the Sudbury region, or of relatively lower grade, but containing much gold and silver, as from Trail. The remainder of Canada's copper production is exported as ore to foreign smelters

for treatment, some of it being concentrates and some of it untreated. The reasons why this condition exists are various and complicated. In brief it may be stated that the copper producing industry in Canada has been of slow growth, and has been prosecuted largely by foreign capital which already possessed established business connections outside Canada. In the early days it was much cheaper to arrange for the final treatment of the Canadian product in established foreign plants. It was easier, and there were fewer capital risks.

At the present time over 80 per cent of the refinery capacity of North America is located within fifty miles of New York city, and is, therefore, in the immediate vicinity of the largest American markets and shipping ports. An important factor in determining the location of these refineries has undoubtedly been the enormous saving that has been effected by reducing to a minimum the time that capital is locked up in the refined copper in transit. Another factor determining their location in this district was the possibility of securing relatively cheap power, cheap labor, and cheap supplies of all kinds, including appliances and machinery. Moreover the freights on the raw materials and supplies would be lower than on a finished product and on supplies hauled a long distance. All the conditions which brought this about may be summarized by stating that refining could be done more cheaply and conveniently in the district where the large refineries are now located than elsewhere. Once these large refineries were established in their present location it has become increasingly difficult for new organizations to compete against them and break into the market, unless the circumstances are exceptional. Moreover the capital interested in the established refineries is also the preponderating interest, directly or indirectly, in the Canadian Copper production. Under these circumstances it should not be a matter of surprise that Canada's copper is not refined at home, nor can it be expected that the conditions will be changed unless existing circumstances, altered by natural conditions or by design, become such that it will be more profitable to refine Canadian ores in Canada than in a foreign country.

2. Canadian production available for a refinery.—The nickel-copper mattes produced in the Sudbury district, Ontario, present a special problem in refining, involving the recovery not only of the copper, but also of the nickel, and therefore do not need to be considered here. That portion of Canada's copper which can tentatively be considered as available for refining in Canada is the British Columbia production.

A survey of the field shows that the British Columbia copper production may be considered as tributary to two principal localities. The production of Rossland and the Boundary country is all confined to the southeastern part of the province, and geographically, would naturally be tributary either to Trail or to a plant located elsewhere in one of the Kootenays. The balance of British Columbia production comes from points on the Pacific coast and therefore may be considered as tributary to certain points on tidewater.

Again, considering the present development of the various known copper producing mines, we find that the mines of the boundary district have probably reached their maximum production and are now on the decline. The Motherlode, the largest mine tributary to the smelter at Greenwood, is estimated to contain about two years' supply of ore. The mines at Phoenix, tributary to the smelter at Grand Forks, are credited with containing enough ore to keep the smelter working to capacity for only a few years more. The Rossland mines are stated never to have been in better condition, but the total copper content of these ores is comparatively small. Other less well known mines produce ore from time to time but their operation has been more or less spasmodic and they cannot be relied on to produce a large tonnage or to produce continuously for any length of time. Undoubtedly new ore bodies will also be discovered, prolonging the lives of existing plants in this section of the province, but the ore supplies immediately in view are such that it is extremely improbable that the annual production of copper from the Kootenays will materially increase in the near future.

On the coast we find that extensive development work has been in progress for the last three or four years, showing the existence of large ore reserves, particularly at Britannia and at Anyox. On the strength of this development preparations have been made at both localities for handling greatly increased outputs of ore. There are, in addition, a number of other smaller properties from which additional ore supplies may be expected, and in general it may be stated that the districts tributary to the coast appear to be the most promising, in regard to future development.

In 1914 the interior districts produced approximately 21,000,000 pounds of copper, while the districts tributary to the coast produced about 24 000 000 pounds. In 1915 the interior districts produced 22,700,000 pounds, against 33,980,000 pounds credited to the coastal district. It is not probable that the annual production of the interior, within the next few years, will much exceed this amount; the coast districts on the other hand give promise of at least doubling the output within the next two years.

A new district in the vicinity of Princeton, in south central British Columbia, has recently been extensively explored largely by diamond drilling and development is now under way. Plans have also been prepared for the erection of a large concentrating plant, and it is proposed to treat the concentrates in the smelter at Greenwood. It can therefore be anticipated that the production of the interior district, east of the Cascades, will for a time show a considerable increase. On the other hand, if later developments show that it is more economical to produce Bessemer copper from these ores in the vicinity of the mines, or even on the coast, this production would naturally be tributary to a coast refinery, particularly, when the direct railway to the coast, now nearing completion, is ready for traffic. The establishment of a refinery in British Columbia and its location would have an important bearing in determining the location of a new smelting and converting plant for the treatment of the Similkameen ores, assuming that other controlling conditions are satisfied.

If the establishment of a refinery were dependent only on the assurance that an adequate supply of Bessemer copper can be produced, it may safely be stated that there is enough ore in sight to supply the copper necessary to keep a plant of at least 50 tons daily capacity (36,500,000 lbs. per annum) in operation for an indeterminate number of years, a period of time, however, which would be longer than the normal life of the plant. In reaching any conclusion as to the probable commercial feasibility of such a refinery there are a number of collateral conditions that must be considered and weighed and there are numerous conflicting interests which must be apprised and adjusted. These conditions are set forth in the succeeding sections of this report.

**Opposing Conditions.**

1. Present Ownership. The only large Canadian controlled corporation now engaged in mining and smelting copper ores in British Columbia is the Consolidated Mining and Smelting Company of Canada, with smeltery at Trail, and mines at Rossland and elsewhere. All the other important producers of copper or copper ores are controlled by United States capital. Stating the same fact in another way, it is to be noted that only about 10 per cent of the copper production of British Columbia is home controlled, the balance, about 90 per cent, is foreign controlled. When the anticipated increase in production from coast points takes place, this balance will approximate 95 per cent of the total.

2. Existing Contracts. Nearly all the companies which are mining copper ore in British Columbia and all the smelters which are producing blister copper have contracted for the disposal of their output. These contracts usually run about five years, and existing contracts have at least two years yet to run.

3. Smelter Capacity. The smelter capacity at present available on the coast is not sufficient to treat all the ores now produced there. It is reported that the smelter at Anyox is to be enlarged to a capacity of about 4.000 tons of ore per day (the present capacity is about 3.000 tons), but this will provide only for the output from Anyox and for a few smaller tributary properties. Another smelter, especially equipped to treat concentrates as well as ordinary ores of copper, would be required to treat the ores and concentrates from Britannia, and such other ores as may be available from time to time. The capacity of this smelter should be at least 500 tons per day, and provision should be made to double this capacity, if necessary. It is possible that the Company now operating the Britannia mine might consider the erection of a smelter to treat their own ores, and to produce blister or Bessemer copper, but at present their entire output is sold under contract. The smelter at Ladysmith, now idle, is capable of treating some of the ores, but not so economically as a more modern plant specially designed for the purpose. It would probably seriously handicap the development of a coast refinery to attempt to adapt the Ladysmith smelter as it now stands to the needs of such refinery.

4. Marketing. One of the most difficult problems confronting a Canadian refinery would be the marketing of its products. Hitherto Canada's total consumption of copper has been about 20 000 tons per annum, slightly less than half the production of British Columbia. The greater part of this copper is imported into Canada in manufactured forms, particularly as wire, rods, and sheets. The surplus production from a Canadian refinery would have to be sold in the open market. If it is produced under natural conditions and at reasonable cost, there appears to be no reason why it could not successfully compete with copper produced elsewhere. The competition of the large purchasers in the United States and in South America would have to be faced, and even possible price-cutting. On the other hand, there is a possibility that the cheapness of production and the geographic location of the refinery might give certain advantages which it would be very difficult to offset.

Under existing conditions eastern manufacturers who require refined copper can, or could before the war, often obtain deliveries within a week of the placing of the order. Eastern refineries often had their orders booked in advance of the refining, and as a consequence there was little capital locked up in the copper in transit.

A refinery in Western Canada, operating under existing conditions, would have the following factors to contend with:

i. Long haul to eastern market on a refined product, and therefore a higher rate.

ii. An unusually long interval must elapse between the receipt of orders and the time of delivery—resulting in proportionally larger interest losses on copper in transit.

iii. Variety of forms in which refined copper must be delivered to suit the requirements of individual consumers of small lots, means an expensive plant for a small output.

iv. Canadian demand is chiefly for copper in manufactured forms. The demand for refined copper in ingots, wire, bars, and cakes is very small.

v. Competition of foreign copper, much of which can be laid down in the eastern market more cheaply.

It therefore appears desirable that other markets than that offered by eastern America be considered. Data with respect to the requirements of these markets are not immediately available. It may be pointed out, however, that refined copper from a British Columbia coast point can be laid down in British ports, and in certain continental ports at less cost per pound than from many of the interior United States producers. The Asiatic markets for manufactured products, and the Australian market are also open to a coast refinery, with corresponding low freights. It appears extremely probable that any surplus production from such a refinery could be very easily disposed of in the face of eastern competition.

I am inclined to think that it would be most profitable for a coast refinery to transform its own refined copper into manufactured products such as wire, rods, bars, sheets, and tubes. These products could be marketed as easily as the refined copper. There would be a very considerable saving in interest losses on copper in transit and a probable saving in refinery equipment.

5. Power Problems. The principal individual item of expense in the operation of a copper refinery is the cost of power. Hydro-electric power can be produced at a number of points on the coast of British Columbia at a cost of less than $10.00 per horse power a year. The most desirable and convenient power sites appear to have been transferred to private hands, but most of them are neither being utilized nor developed. The tax which these holding interests are inclined to levy on bona fide industries requiring the power is apt to be almost prohibitive. Before a refinery could be established it will be necessary to arrange to obtain power at a reasonable figure, which should not exceed $10.00 per horse power year, delivered at the plant. The operating company should own and control its own plant, and there should be sufficient available power in reserve to provide for reasonable expansion, and the development of subsidiary industries.

6. Diversity of Products. The nature of the products from the different centres makes certain commercial adjustments difficult but not impossible.

The Bessemer copper which will be produced at the Trail smelter will contain an unusual amount of gold, so much so that it will be practically impossible to satisfactorily and safely sample it. For this reason the owners of the Trail smelter would probably hesitate in agreeing to supply their blister copper to an independently controlled refinery unless special arrangements are made for its separate treatment. They have al-

ready made arrangements to install two Great Falls type copper converters, and I understand are preparing to refine their own copper on a small scale.

Again, the production of the Britannia mines, which will be about 25,000,000 pounds per annum within two years' time, is in the form of ore and concentrates. Several other mines on the coast also produce ore and do not reduce it to matte or Bessemer copper. As already noted, a smelter would have to be provided, especially equipped to treat these products.

**Organization of a Refinery.**

The organization of a copper refining company in Canada will require much consideration and some educative work. At present there are four large companies operating in British Columbia, whose interests are more or less conflicting. The total Canadian output available for treatment in an electrolytic refinery is comparatively small and it is therefore very desirable that as much as possible of the copper which these companies produce be treated at one plant.

One of these companies, the Consolidated Mining and Smelting Company of Canada, operating at Trail, is largely Canadian owned and is in the best potential position to start refining, both as regards equipment and technical staff. The plants at Trail now include a blast furnace equipment, an electrolytic lead refinery, and an electrolytic zinc refinery. Two basic converters, Great Falls type, are being provided for the production of Bessemer copper. Under the circumstances it was a comparatively easy matter for this company to arrange to refine their own copper. It will be possible to commence operations on a very small scale, and to expand as the circumstances require. There need be no serious increase in the present overhead charges, and the necessary capital expenditure will not have to be very great. Power costs will probably be comparatively high, about $20 per H.P. year, and the location of the plant is not favorable to cheap freights for incoming supplies and outgoing products. A refinery at Trail would naturally receive copper from the smelter at Grand Forks, including a rail haul of about 88 miles. Any copper produced at Greenwood might also easily be sent to Trail, the rail haul being 103 miles. Existing business arrangements and other economic conditions may, however, prevent any of this copper from the Boundary district reaching a refinery at Trail.

On the other hand not only is the amount of copper that will be tributary to the plant at Trail small, but the copper produced from the Rossland ores contains unusually large amounts of gold, seemingly somewhat irregularly distributed through the cakes, and I am informed that experience has shown that it is practically impossible to sample copper of this character satisfactorily without excessive expense. Therefore it is to be expected that while Trail will be able to produce refined copper from the products of its own plant, or from any Bessemer or blister copper that may be sent to it for treatment, it is natural to infer that they will not be willing to co-operate in the establishment of a refinery elsewhere, unless they can obtain specially favorable terms for the treatment of their own copper, or be guaranteed its separate treatment.

The companies operating at Grand Forks and Greenwood, which points, as already noted, are naturally tributary to Trail, would undoubtedly be willing to contribute their copper to some other point than Trail, the only questions involved being commercial ones.

The two principal producers on the Pacific coast of British Columbia are the Granby Consolidated Mining, Smelting and Power Company, with smelting works and mines located 110 miles north of Prince Rupert, and the Britannia Mining and Smelting Company, with mines near Britannia Beach on Howe Sound, about 30 miles north from Vancouver. If the interest and co-operation of these two corporations could be secured the success of such a project would be secured. Without the co-operation of both these producers the amount of copper available would be too small to warrant the establishment of a refinery on the coast. Both companies have existing contracts which will have to be completed before they are free to accept new obligations and these contracts have several years to run. Both would probably be willing to enter into new contracts with a Canadian refinery, but strictly on a commercial basis—that is the Canadian refinery must at least give them as favorable terms as they now receive, or are offered when renewing contracts.

The Canada Copper Corporation, which now controls the interests of the British Columbia Copper Company, and which has been developing the new deposits in the vicinity of Princeton, B.C., is controlled in the United States. At present a small amount of converter copper is produced at the Greenwood plant from Boundary ores, and is shipped to a United States refinery under contract. Plans are under way for the erection of a concentrating plant to treat the ores from the mines near Princeton. The concentrates at this plant are to be sent to the smelter at Greenwood, and it is to be presumed that the copper from this ore will also be shipped to the United States for refining.

**Location of a Canadian Copper Refinery.**

The following points have been considered in an attempt to reach some conclusion as to the best location for a Canadian copper refinery: A St. Lawrence point, Quebec; Sault Ste. Marie, Ontario; Port Arthur, Ontario; Trail, British Columbia; two Pacific coast points, British Columbia.

The following are the principal factors that have been considered in each case: Relation to sources of supplies of blister copper; Relation to probable markets for refined copper; relation to sources of materials for construction and maintenance; probable freights inward and outward; power costs; Fuels and other supplies; labor costs; interest losses on copper in transit.

My conclusion is that British Columbia offers the best locations for the refining of the copper at present available for treatment. With respect to the location of a refinery on the Pacific coast as opposed to one at Trail I consider that the coast unquestionably offers the best site for a commercial refinery.

The coast production will, in a few years' time, be at least ten times that of Trail, apart from the copper which might be sent to Trail from the two interior smelters. These smelters, however, could also contribute to a coast refinery, and therefore their production does not need to be specially considered when weighing the comparative merits of locating at Trail, or at a coastal point. Trail would have lower capital and overhead charges to meet than a coastal point, but the power costs fuel costs, and labor costs would be higher, as would freights on supplies and products.

Almost any coastal point accessible to one of the trans-continental railroads is favorably located with respect to freight rates on raw materials and finished products and has, moreover, an enormous tributary area with low freight charges. Certain points offer particularly low power costs, and cheap oil fuels are

available. Inasmuch as eastern manufacturers in Canada would require not more than half the output of such a refinery, even if they were equipped to handle such a quantity, the balance would have to find another market. The potential possibilities of the British, Asiatic and Australian markets are such that the available surplus could probably be placed in these markets more cheaply from the British Columbia coast than from any other point in Canada.

In brief, I consider that marketing conditions alone render it inadvisable to locate a refinery anywhere in eastern Canada for the primary purpose of refining British Columbia copper, and I consider that certain Pacific coast points would afford the best location.

2. Selection of a site.—Since it is assumed that if a copper refinery were to be established on the coast it would be operated as a commercial enterprise, the site selected should be chosen only on its merits. Primarily it should be on tide water, and hydro-electric power should be available. The amount of power should be much in excess of the immediate requirements to allow for expansion, and the development of certain related manufacturing industries if these appear desirable. The site, moreover, should be centrally located to facilitate the assembling of the products of the different contributing centres, and should be where climatic conditions are most favorable.

### Equipment Required.

1. Power site.—A suitable site for the development of hydro-electric power will be required. This should be capable of supplying not less than 5,000 horse power per day, on 24 hour service. This is much in excess of the power required for a 50 ton refinery alone, but scarcely allows for reasonable expansion. There are a number of power sites available where about 20,000 horse-power could be secured and developed at a cost not exceeding $100 per developed horse-power. At the start it would not be necessary to develop the whole of such a power.

2. Refinery and Auxiliary Equipment.—A complete refinery will include the following equipment:

Office building; chemical and assay laboratories; physical testing laboratory; water supply system; power plant, coal bins and equipment, fuel oil tanks and equipment, boiler room and equipment, engine room and equipment, generator room, transformers, motors, switchboards and equipment; furnace building, cranes and charging machine, small water-jacketed blast furnace, anode furnaces, cathode furnaces, casting machines, cast iron and cast copper moulds for anodes, wire bars, ingots, and cakes, moulds for making casting machine moulds, charcoal storage; tank house and equipment; precious metal refinery and equipment; copper sulphate plant; supply storage for furnace department, and for tank house; copper storage, incoming and outgoing; sampling shop and drills; scale house; repair shops, forge and blacksmith shop, foundry, boiler shop, machine shop, carpenter shop, paint shop; shop supply storage; yard, tracks, haulage motors, cars, trucks, and other yard equipment.

3. Smeltery.—If a smelter is established to treat the tonnage of ore for which there is no present provision, the additional equipment needed will depend upon the character of the ores available and their quantity. One or more reverberatory furnaces, and one or more basic lined converters will be required. It is also possible that a blast furnace would be needed though this is not essential. The offices, laboratories, shops, and storage warehouses provided for the refinery would also serve for the smeltery, except that they would have to be made slightly larger.

4. Docks and Equipment.—Docks capable of affording wharfage to at least two vessels, of about 7,000 tons capacity, would be required. They should be equipped for unloading ores, concentrates, blister copper, and supplies as expeditiously as possible. They would also have to be equipped for loading the products of the refinery. The initial cost would vary with the location, and with the size of the plant.

5. Subsidiary Industries. — The establishment of subsidiary industries in close connection with the copper refinery is worthy of consideration. The primary products of such a works would be copper wire or bars, plates and tubes. With the production of electrolytic zinc, it would be possible also to produce brass either in ingots or in manufactured forms.

6. Working Capital.—It is not possible, at the present time, to arrive at any satisfactory estimate as to the amount of capital required, either for the establishment of such a works or for their operation. The exceptional circumstances attendant on the marketing of the products of a refinery located in British Columbia may render it necessary to have a very much larger working capital than is usually required.

Copper refiners as a rule do not purchase the copper treated at their works. They usually levy a fixed treatment charge, and make a percentage deduction from the weight of the crude copper received to compensate losses in treatment. This fixed charge varies with the nature of the product to be treated from $10 to about $20 per ton. They also pay for the gold and silver recovered at current market rates. In the eastern refineries the copper in transit is rarely tied up for more than a week or ten days, exclusive of time consumed in transportation. In a refinery on the British Columbia coast it is probable that the copper in transit through the works and en route to market would be tied up for at least a month, and possibly for two months or more. It seems probable, therefore, that there would never be less than 3,000,000 pounds of copper locked up, and very frequently the amount in transit would be double this quantity. At an average market value of 12 cents per pound this means the loss of interest on a sum of money lying between $350,000 and $750,000, according to the circumstances. Since nearly all the available copper ore, mattes, and converter copper also contain small quantities of gold and silver, the value of these metals, when in transit through the works, would also have to be considered. Their probable value cannot be readily estimated without an accurate knowledge of the products to be treated in the plant. The length of time these metals would be locked up would probably not be less than two weeks, and never more than four.

It is thus apparent that the circumstances of location and marketing may entail a somewhat larger interest loss on metals in transit than would normally occur, and compensatory adjustments for this extra charge would probably have to be made by the refinery.

### General Conclusions.

The author's conclusions may be very briefly stated as follows:

1. The province of British Columbia is the only province which produces enough copper annually to support an electrolytic copper refinery.

2. Within a very short period of time the total amount of copper produced from districts tributary to the Pacific coast of British Columbia will probably be

more than half the total production of Canada, and will be much in excess of that tributary to interior points.

3. For various reasons, which have been cited, the author concludes that the Pacific coast of British Columbia offers the best choice of sites for a refinery.

4. The Canadian consumer does not demand refined copper in any quantity, but purchases copper in manufactured forms; therefore refined copper produced in Canada would for the most part be unsaleable unless provision is also made for its conversion into manufactured forms, particularly bars, rods, wire, sheets and tubes.

5. A market for the surplus copper would have to be obtained. It is probable that refined copper could be marketed in Europe as cheaply as from a refinery in the Eastern United States. It is also possible that the Australian and the Asiatic markets might require the surplus material if converted into manufactured products.

6. There appears to be an opening for the organization of a very considerable commercial enterprise which might include among its activities any or all of the following principal departments:

(a) Copper smelter (treating about 500 tons of ore per day).

(b) Copper refinery (producing about 50 tons of copper daily).

(c) Zinc refinery (producing about 40 tons of zinc daily, including zinc in oxide).

(d) Brass making plant.

(e) Rolling mills (for copper, zinc, and brass).

(f) Bar and wire mill.

(g) Tube mill.

7. The organization of any considerable commercial enterprise founded on the copper productive capacity of British Columbia, either to produce refined copper alone, or to carry on any or all of the associated industries here suggested, is a matter for private enterprise. The successful operation of a refinery is dependent upon the securing of contracts for refining the greater portion of the output of the productive properties tributary to the coast districts of British Columbia. The majority of the producers in these districts have already well established business connections in various quarters and it is not to be expected that they will be willing to enter into new agreements unless reasonable proposals are made to them which it will be to their material advantage to accept.

## REFINERY CONSTRUCTION.

Port Colborne, Ont.—Things are humming across the canal where the Foundation Co. are constructing the nickel plant. The former Grove Hotel is now one large office building occupied by the superintendent and those in charge of various departments of the work.

Two hundred and fifty men are at work and additions to the staff are being made at the rate of about twenty men a day. From 800 to 1,000 men will be at work on the job by spring. One bunk house which will accommodate 150 men is now ready for habitation.

Large quantities of machinery and construction material are arriving daily.

It is safe to say that every place in Port Colborne where living quarters are obtained is now occupied. The demand for furnished suites, single rooms and houses has more than exceeded the supply, and the private citizens, as well as every merchant, have already experienced a benefit from the activity caused by the commencing of the big work.

# GOLD DREDGING IN YUKON*

Dredging has rapidly developed in the Yukon as a highly profitable industry, and dredges are operating successfully not only in the beds and on the bars of rivers, but also on the frozen placer creek claims in the Klondike district. A short time ago the rich claims on the more prominent creeks in the Klondike district proper were being worked by the most modern methods of what is known as ordinary placer mining. Gravels, from which large quantities of gold dust were recovered by this method are now being worked by dredges adapted to the special conditions which exist in that district.

### Yukon Gold Co.

The Yukon Gold Co. is incorporated under the laws of the State of Maine, and commenced operations in the Yukon in 1906. The president of the company is S. R. Guggenheim, the secretary-treas., Chas. K. Lipman, the consulting engineer and general manager, O. B. Perry, all of 120 Broadway, New York. and the resident manager is C. A. Thomas, Dawson, Y.T. The holdings of the company comprise 555 creek, hill and bench claims in the Klondike district.

The Yukon Co. has constructed several dredges. These are in operation on Bonanza, Anderson concession, Hunker, Gold Run and Eldorado.

The power for operating dredges is obtained from the company's hydro-electric plant operated by water from the Little Twelve-mile river carried through five miles of flume and delivered to the plant under 650 feet net effective head. The installation consists of three 650 K. W. generators, directly connected to three water wheels of the impulse type. The main transmission line is 36 miles in length, operating at 35,000 volts, with 18.2 miles of extensions and secondaries.

### Canadian Klondike Mining Co., Limited.

The original company from which the present Klondike company has been evolved was incorporated under the laws of the Dominion of Canada, in November, 1904, and commenced operations in August, 1905, on Hydraulic Mining Lease No. 18, which is known as the "Boyle Concession" on the Klondike river. J. W. Boyle, Dawson, Y.T. is general manager of the company.

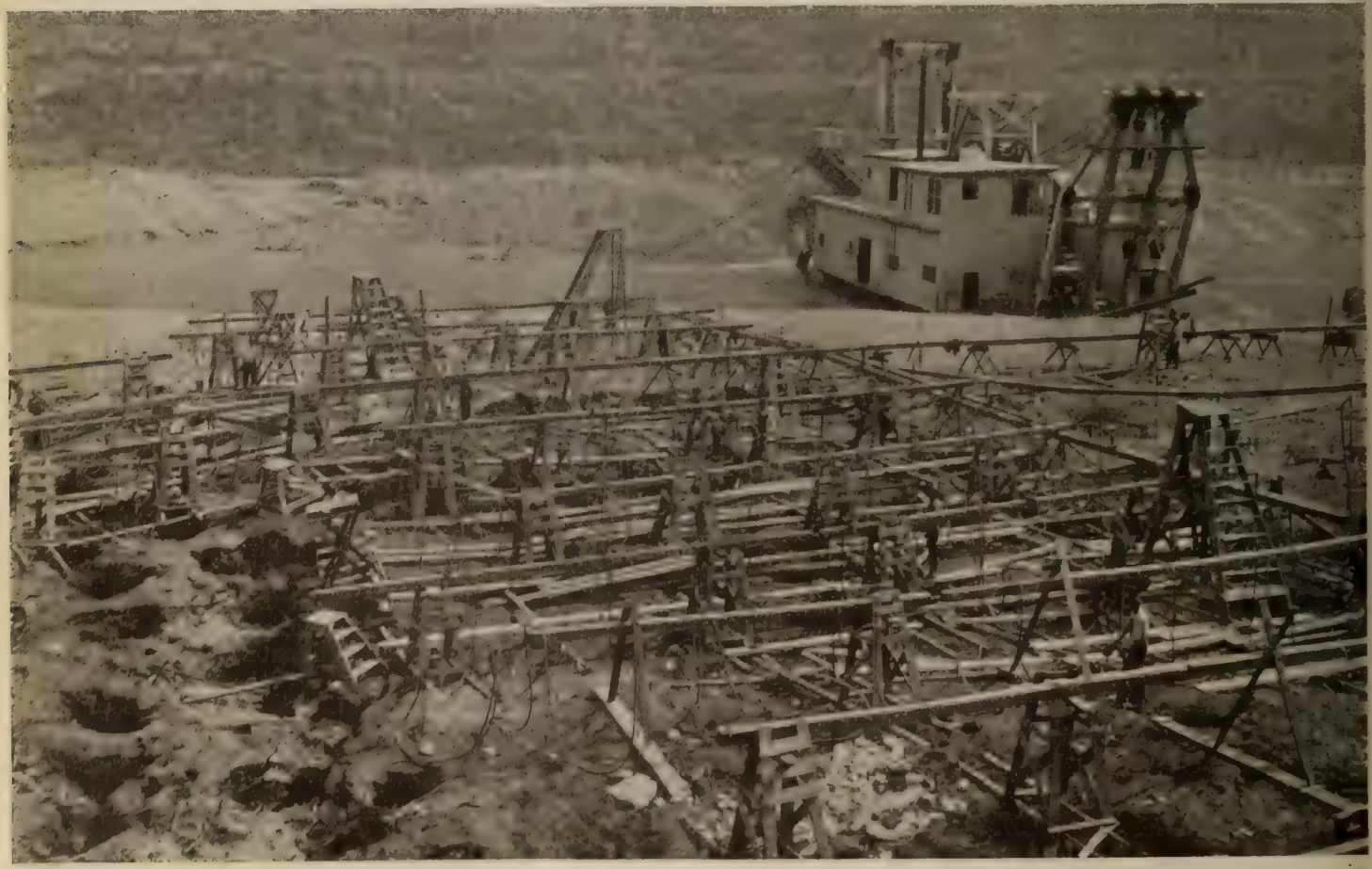
Mr. Boyle states that the approximate area of dredging ground within the Boyle concession, insofar as physical conditions are concerned, consists of approximately six and three-quarters square miles, being the entire flat of the Klondike valley within the confines of the concession. It is estimated by the general manager that this area contains 250,000,000 cubic yards of material, of which approximately 120,000 000 cubic yards have been proven by drilling and sinking of shafts to contain values which will be profitable for dredging. Prospecting is still being conducted on the undeveloped portion of the concession, and there is every indication that approximately 50,000 000 additional cubic yards will prove valuable, although at present insufficient prospecting has been done to positively establish the values.

Operations were commenced on the Boyle concession in August, 1905, with dredge Canadian No. 1, a 7 1-2 cubic foot dredge, electrically driven with power developed with a steam driven turbo-generator plant of 400 K.W. capacity. Both dredge and power plant were erected on the flat of the Klondike valley directly opposite the mouth of Bear creek.

* Extract from a report published by direction of the Minister of the Interior.



Dredge Yukon No. 4, operating on Lower Hunker creek.



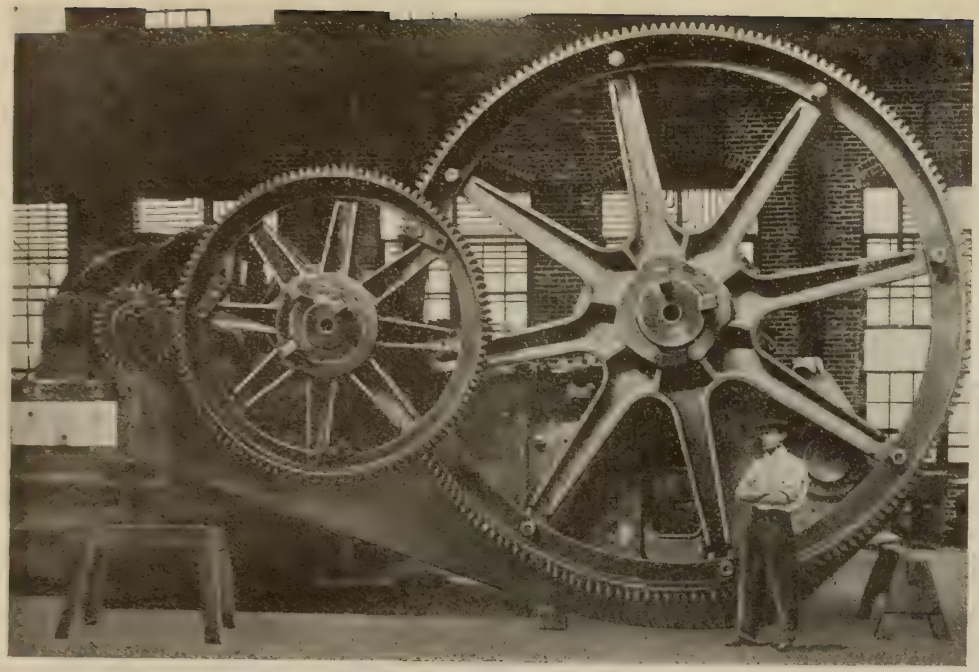
Dredge Yukon No. 5, operating on Bonanza creek.



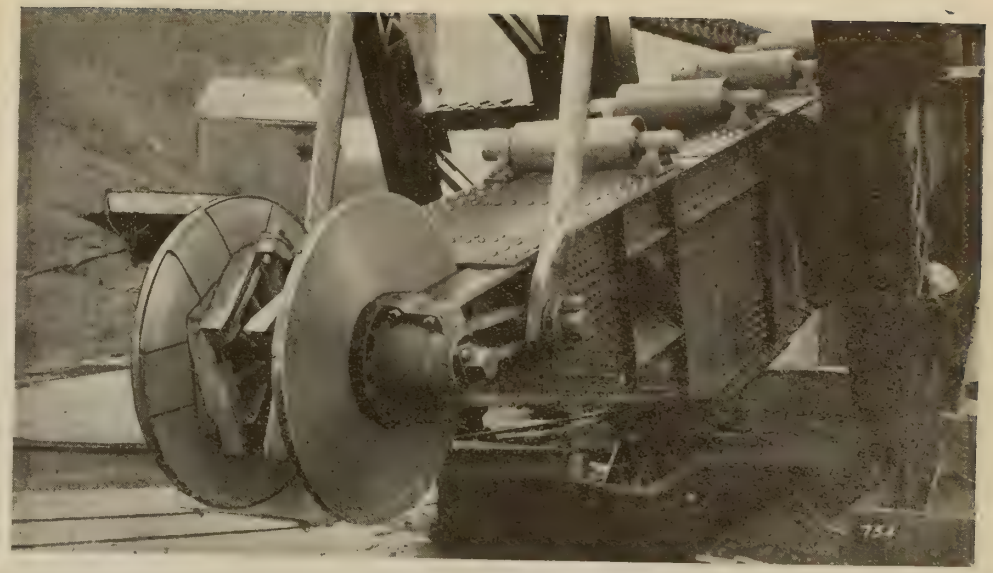
Stern view of dredge Canadian No. 3.



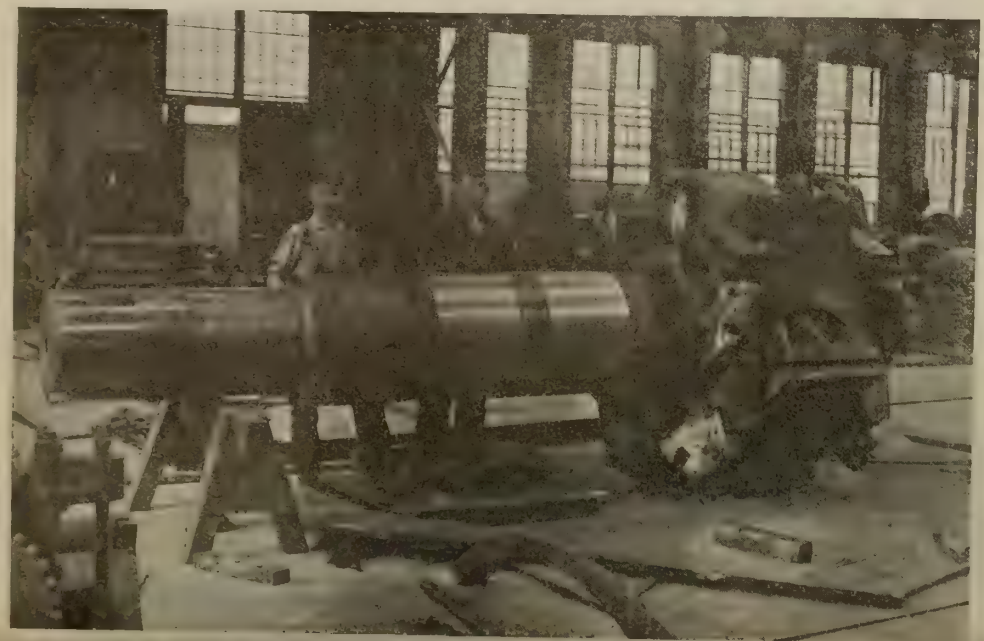
Dredge Canadian No. 3 in operation.



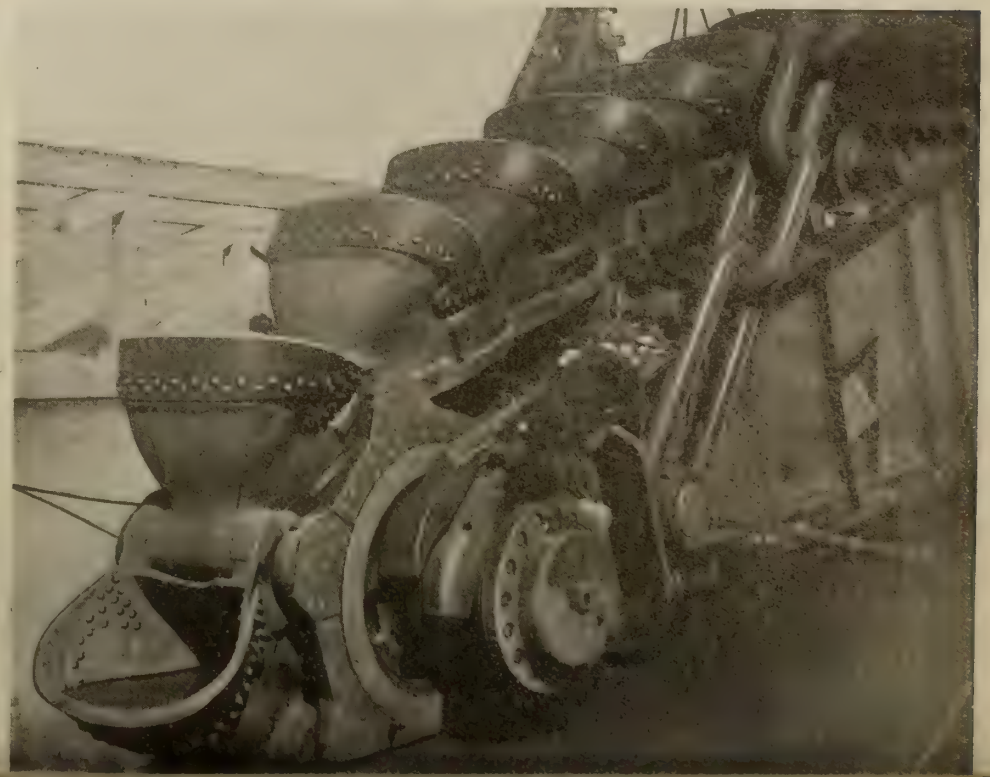
Main drive set up, on dredge of Canadian Klondike Mining Company, Limited.



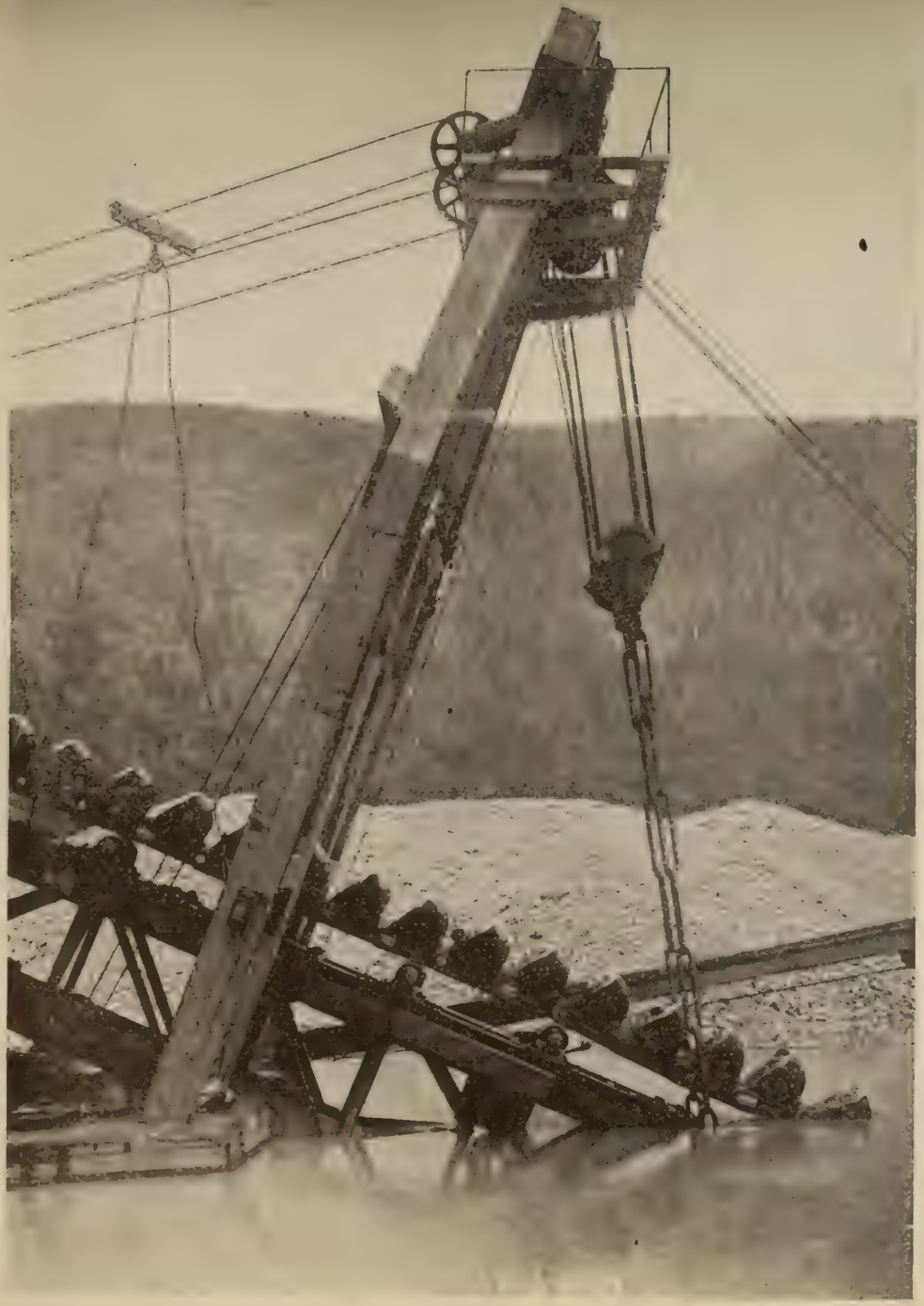
Lower tumbler with bucket line of steel Bucyrus, 7 foot dredge, Yukon No. 9.



Upper tumbler with shaft [illegible] Canadian Klondike Mining Company, Limited.



Digger [illegible] Cap. [illegible] No. 3



Bow gauntree of 5-foot steel dredge.



Bucket line, Canadian No. 3.

This dredge operated on the Boyle concession during the open season of each year from 1905 until 1912 inclusive. In the fall of 1912, dredge Canadian No. 1 was dismantled at a point on the Klondike valley about two miles below Bear creek. In the spring of 1913 this dredge was reconstructed on claim No. 21, below Discovery on Hunker creek and worked claims Nos. 22 and 22A below Discovery. The dredge then worked up stream on Hunker creek continuously during the open season of 1913 and 1914 and is now operating on claim No. 8, below Discovery.

Dredge Canadian No. 2, a 16 cu. ft. dredge, was erected in the summer of 1910 at a point on the flat of the Klondike valley about one mile below the mouth of Bear creek. This dredge was completed and commenced operating on the 4th of November, 1910, and continued operations until the 4th of December following. It was also operated continuously during the open season of each year from the spring of 1911 until the 10th of October, 1914.

Dredges Canadian No. 3 and Canadian No. 4 were constructed in 1912 and 1913.

Dredge Canadian No. 3 commenced operating on the 10th of May, 1913, and has since operated continuously during the open season of each year.

Dredge Canadian No. 4 commenced operations on the 20th of May, 1913, and since that time has operated continuously during the open season of each year.

**The Canadian Klondike Power Co. Limited.**

This company was formerly known as the Granville Power Company, Limited, and was incorporated under "The Companies Act" of the Dominion of Canada on the 29th of April, 1910. The officers of the company are, president, James McDougall, secretary, A. E. Nash, and manager, J. W. Boyle.

The plant of the Canadian Klondike Power Co. is situated on the Klondike river, 26 miles from Dawson. The manager states that twelve dredges have been supplied with power from this plant, and that the cost of power varies according to the quantity supplied, the highest price charged being 3 cents, and the lowest 2 cents per kilowatt hour.

Construction work was commenced in June, 1910, and the plant started generating power on the 6th of May, 1911. The following statement was furnished by the manager concerning:—(a) water grant and ditch, (b) equipment and (c) transmission lines:—

Water Grant and Ditch.—The water diverted for power purposes is obtained under authority of three water grants from the Canadian Government which provide for a total diversion of 30,000 miner's inches (equivalent to 45,000 cubic feet of water per minute) from a point on the north fork of the Klondike river about four miles from its confluence with the main channel thereof.

The water is conveyed from the point of diversion by means of a ditch six miles in length. The ditch is 18 feet in width at the bottom and 28 feet in width at the top, with a minimum depth of 5 feet. The ditch conveys the water to the hillside facing the main valley of the Klondike river, and is delivered to the water wheels through two lines of pipe graduating from 72 to 66 inches in diameter, each 1676 feet in length, and with an effective head of 228 feet.

Electric Plant.—Two 5,000 H.P., I. P. Morris reactionary turbines direct connected to two 3,000 K.V.A. Westinghouse alternators, 2,300 volts, 3-phase, 60 cycle, 514 R.P.M. One 85 K.W. exciter, direct connected to a 36 inch Pelton impulse wheel. One 85 K.W. exciter, direct connected to a 110 H.P. induction motor. Two banks of transformers, each bank consisting of three 1,250 K.W., 2,300 volts to 33,000 volts, 60 cycle, water-cooled, single phase transformers, delta connected. Each transformer is housed in a separate concrete vault. The switchboard is made up of six panels on which are mounted all the necessary instruments and switching devices, including graphic recording volt meter, watt-meter, power factor meter, frequency meter and Tyrell regulator. All switches carrying over 125 volts are located in a concrete vault in the basement of the power station.

Transmission Lines.—There are two lines of transmission from the North Fork power station.

1. The Dawson line which runs to the city of Dawson, a distance of 22 miles from the power house, and supplies power to: Canadian Klondike Mining Co.'s large centrifugal pumping plant at the mouth of Hunker creek, at which point is situated a sub-station with 1,000 K.W. transformer capacity; Dredge Canadian No. 2, Canadian Klondike Mining Co.'s machine shops, and the main camp of the mining company are supplied through Bear creek sub-station which has 1,000 K.W. transformer capacity; Dredges Nos. 3 and 4 of the Canadian Klondike Mining Co.'s equipment, which receive power from Bonanza basin sub-station of 2,000 K.W. transformer capacity; The city of Dawson, for the purposes of the Dawson Electric Light & Power Co. Limited, and the Dawson City Water & Power Co. Limited, which furnish the city of Dawson with all power, light and water services (including fire protection service) all of which is electrically operated. This power is also furnished from Bonanza basin sub-station.

2. The Dominion line which runs to the head of Dominion creek, 20 miles distant from the power house. 14 miles out on this line there is a branch line 4 miles long to the Hunker sub-station of 300 K.W. capacity.

The transmission is phase, 33,000 volt. Wooden poles are used, which are 35 feet above ground and are spaced 32 to the mile. Lightning arresters are installed at the power house and at all sub-stations.

The plant employs a station foreman, two operators and two oilers. The Bonanza basin sub-station has a day and a night attendant. The other sub-stations are cared for by electricians in the employ of the dredging corporation using same. An average of 4 men are employed in connection with the intake and ditch operations.

Approximately 1 1-2 miles of the ditch are in gravel and 4 1-2 miles through muck and glacial silt. In order to retain the frost, during the summer months, for the greater stability of the banks, the lower bank of the ditch, excepting in gravel cuts, is faced with brush as a protection from the sun's rays. As soon as the cold weather sets in and ice starts to form, the ditch is filled bank full, allowed to freeze over until a coating of from 18 inches to two feet of solid ice has formed—or sufficient to remain up in the form of a bridge—when the water is dropped two or three feet, leaving an air space between the bridge of ice and the surface of the water in the ditch.

Electric heaters are installed at the intake and at intervals of about two miles in the ditch and at the pressure box at the head of the pipe lines, through which approximately 90 K.W. of heat are used, enabling the plant to operate the entire year and through temperatures extending to 70 degrees below zero; and in one instance operating through a week with average temperatures of over 60 degrees below zero, without any difficulty.

The pipe line has been covered, there being a roof built for the upper part of the pipe, leaving an air space; the roof consisting of poles covered with about one foot of moss and one foot of gravel.

**North West Corporation, Limited.**

The North West Corporation, Limited, is an English company which was formed in 1913 with an authorized capital of £1,500,000. Its holdings are within the Indian river watershed in the Klondike mining district, and consists approximately of 75 miles of valleys, which have been estimated to contain 600,000,000 cubic yards of gold-bearing gravels.

Overlying the pay gravels in the valleys is a heavy covering of overburden consisting of moss and muck cemented with ice. This overburden is a non-conductor, and prevents the underlying gold-bearing gravels from being thawed by atmospheric conditions.

Ground-Sluicing.—This company employs, on an extensive scale, the ground-sluicing method of preparing the valley ground for actual digging. By the use of surface and pressure water conveyed through canals and ditches to the ground being prepared, the moss and muck are worked off to the underlying gravels, and carried away in suspension to the main creeks and rivers. The underlying gravels, being exposed to the sun's heat, soon thaw to bedrock. The greater the area treated the quicker the gravels thaw to bedrock, the depth of thaw each season varying from 10 to 16 feet in gravel.

Muck.—Muck overburden is a frozen substance having the following characteristics: Gray to black in color, composed of organic matter with particles of sand and silt cemented by ice. The temperature of frozen muck varies from 8 degrees to 12 degrees below freezing point.

Overburden removed in 4 years amounted to 3,307,670 cubic yards, at a cost varying from 2 cents to 8 cents per cubic yard.

Ditches constructed and being used for ground-sluicing purposes include: Dominion-Granville ditch, capacity 1,000 miners' inches, length 14 miles; Burnham-Jensen ditch, capacity 600 miners' inches, length 8.25 miles; Caribou-Nevada ditch, capacity 3 000 miners' inches, length 8 miles; Quartz creek ditch, capacity 1.000 miners' inches, length 7 miles; Other ditches 15 miles. The average number of men employed during the summer season is 140.

**North American Transportation & Trading Co.**

This company has a dredge of the Risden type, steam driven, open bucket line, and a bucket capacity of 5 1-3 cubic feet, operating on Miller creek. This dredge was built on Walker's fork in the year 1907, and was moved to Miller creek during the winter of 1912. The agent of the company states that prior to the installation of the dredge, a considerable area of ground was thawed to bedrock by the method of ground-sluicing, and that the quantity dredged in 1914 was 218,447 cubic yards.

**Notes on Dredge Construction.**

From experience gained by the Canadian Klondike Mining Company in connection with No. 1 dredge, alterations were made on dredges Nos. 2, 3 and 4, for the purpose of overcoming the difficulties of operating in cold weather, and the result is that these dredges have been operated without difficulty through temperatures exceeding 50 degrees below zero, and have lengthened the dredging season (which was formerly accepted as being about 150 days per season) to about 240 days during an ordinary season. A record operation of 270 days was made by Canadian No. 2.

The principal alterations made to effect this change were: Construction of a box girder type digging ladder with raised sides and a heating compartment in the ladder to prevent ice from forming thereon. Tailing stacker built in the form of a box girder with the return rollers placed inside of (instead of underneath) the stacker, the whole being enclosed during cold weather with canvas housing stretched over steel angle arches. The interior of this is steam heated, and the only exposure of the belt to cold weather is where it passes over the drum at the outer end of the stacker. The construction of a carefully built double boarded house enclosing all machinery and stairways, steam heated throughout by means of a 70 H.P. boiler installed within the hold of the dredge, from which hot water is used to keep ice from forming on the exposed sheaves in use on the bow of the dredge.

Owing to the difficulty experienced in handling heavy pieces of machinery on board the dredge first constructed, alterations were made in dredges Nos. 3 and 4 by erecting an overhead framework upon which a 20-ton travelling crane is operated, thereby eliminating all doors in the sides of the dredges, access to the dredge for the purpose of removing or installing machinery being had through hatchways in the roof of the housing. This structure extends 16 feet beyond the bow gauntree so that any piece in use on the dredge can be picked up on the shore by the crane, carried aboard, and placed directly over the machine to which it belongs, with the exception of parts of the winches and ladder hoist.

In operating dredge Canadian No. 2, the hull of which, like all other conveyor type dredges, was built in the form of a box, it was found that the increase in the weight of machinery at the bow had been disproportionate to that of the washing plant. The result was that the dredge was down at the bow to such an extent that it interfered with the proper washing of the material on the tables, owing to the loss of grade in the stream-down sluices. The design of the hulls of dredges Canadian No. 3 and Canadian No. 4 was therefore altered, so that instead of being 12 feet in depth throughout, as in the case of Canadian No. 2, these dredges were constructed 12 feet in depth at the stern and 14 feet 6 inches at the bow.

Instead of using a single steel digging spud, and a wooden spud for stepping on, all three of the 16 cu. ft. dredges were equipped with two steel digging spuds placed as close together as the width of the trailing stacker would permit, and as a result no loss in time was sustained in stepping forward. This altered the system in vogue on other dredges of dropping the wooden spud and swinging the entire width of the pond for the purpose of moving the dredge forward.

**The Bucket Line.**

The bucket-line is the most important part of a dredge and is the most expensive both in initial cost and in maintenance. There are two types of bucket-line, namely, open-connected and close-connected. In the open-connected there is alternate bucket and link and in the close-connected no link intervenes. The original idea of an open-connected bucket was that it would dig better in hard ground and in soil containing large boulders, but nearly all modern dredges use the close-connected bucket-line.

The bucket includes a bottom or back, a hood and a lip and these are fastened together with a pin and bushings. Buckets differ greatly in shape. The chief difference being in length of pitch, angle of lips, depth and width.

The general manager of the Canadian Klondike Mining Company has furnished the following information concerning the construction of buckets in his company's dredges:

The bucket is cast in a single piece insofar as the bottom or base and the hood are concerned, and except where there is a flaw in the casting it has a minimum life of about 600 days. Both high-carbon steel and manganese have been used in the construction of buckets. Where high-carbon steel is used an inserted plate of manganese steel is placed just back of the lower end or single eye of the bucket where it is subjected to the greatest wear, in order that this part may be renewed when the bucket wears down. This practice was found unsatisfactory, however, and since 1912 in all buckets constructed for the company's use manganese steel has been used.

The lip is composed of manganese steel, 2 3-4 inches in thickness, and 1 1-2 inches deep, with an average life of from 180 to 200 days.

The buckets for the 16-foot dredges have given considerable trouble due to the enormous amount of friction on the pin and bushing, and after many experiments the company adopted the use of manganese steel throughout, that is, manganese buckets, pins and bushings. The size of the pin has also been increased from its original diameter of 7 inches to 7 1-2 inches, using a hollow cast manganese steel pin which is now giving satisfactory results.

The bucket lip originally installed was 2 1-4 inches thick by barely 14 inches deep, of which approximately 10 inches were available for wear, since, when this portion was worn off, it became a matter of economy to discard the unworn part and instal a new lip.

In 1914 an alteration was made by increasing the thickness of the lips half an inch, and the height approximately 2 1-2 inches in the middle, and in addition to the longer life and smaller percentage of waste in these lips they stand up much better under severe service, as the first lips in some instances gradually bent in the middle. The alteration of the lip in this manner has increased the carrying capacity of the buckets from 16.1 cubic feet to about 17.2 cubic feet.

The principal difference between the shape of the buckets used by the Canadian Klondike Mining Co. and those of other companies is that the former are for the most part more rounded on the lip and have less pitch, with slightly more angle to the lips, which has the effect of preserving a thicker cutting edge.

Bucket pins for the 16-foot dredges are composed of manganese steel; are 7 1-2 inches in diameter and vary in weight from 350 to 400 pounds. There are generally 68 buckets in a line, but the number varies from 67 to 71 depending upon the depth at which the dredge is digging.

**The Tumblers.**

The tumblers are the heavy castings at each end of the bucket-line and around which the chain of buckets revolves. In discussing the number of sides in a tumbler, Weatherbe, in "Dredging for Gold in California" observes:

"The question of increasing the number of sides in tumblers so that they more nearly approach a circle in section has been discussed many times, and the question has now been pretty well settled by practical experiment. The number of sides must remain limited for two reasons:

1. In the case of the upper tumbler, after increasing the number of sides to six, its essential duty of holding, pulling round and dumping the bucket-line is impaired and no practical solution in the shape of a sprocket arrangement, any more than is now formed by the lugs and bottoms, as has been suggested, has been evolved; nor is it likely to be, on account of the immensely increasing weights and consequent strains set up. 2. The objection to the lower tumbler-section being increased to more than six or seven sides as a limit, is chiefly on account of the slippage and consequent wear."

The chief considerations that control the shape of the upper tumbler, however, are those which make for the most efficient and thorough emptying of buckets when dumping into the screen-hopper, and the least wear on pins and bushings. To aid this, jets of water are often used, playing into the full bucket as it rotates over the upper tumbler.

The general manager of the Canadian Klondike Mining Company Limited, states that his company's dredges have 6-point tumblers protected with manganese steel wearing plates at all points where they come in contact with the buckets, in addition to which the lower tumbler has a manganese steel tip wearing plate on each point, and the entire outside of the cheeks of the tumbler is sheeted with manganese steel wearing plates, which are replaced when necessary.

All wearing plates on tumblers are designed with a view to wearing through an operating season, which with the company, is approximately 240 days, for the purpose of avoiding lost time during the operating season, and new plates are installed during the general repairs, which are executed in March and April of each year before starting the season's operations.

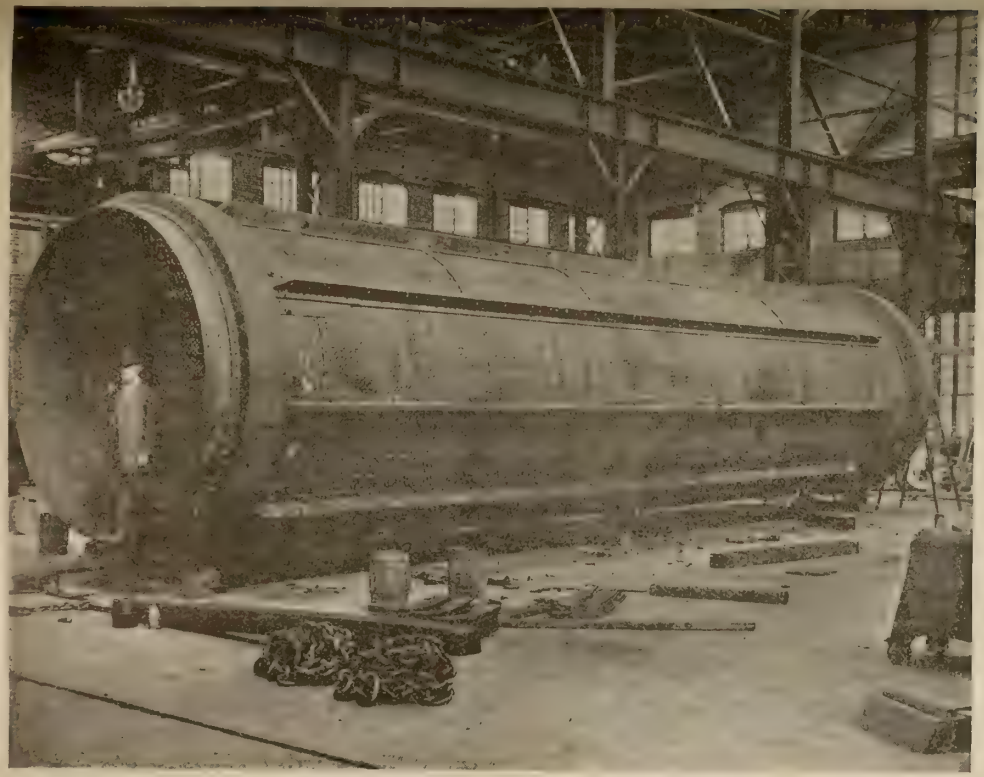
**Bow Gauntrees.**

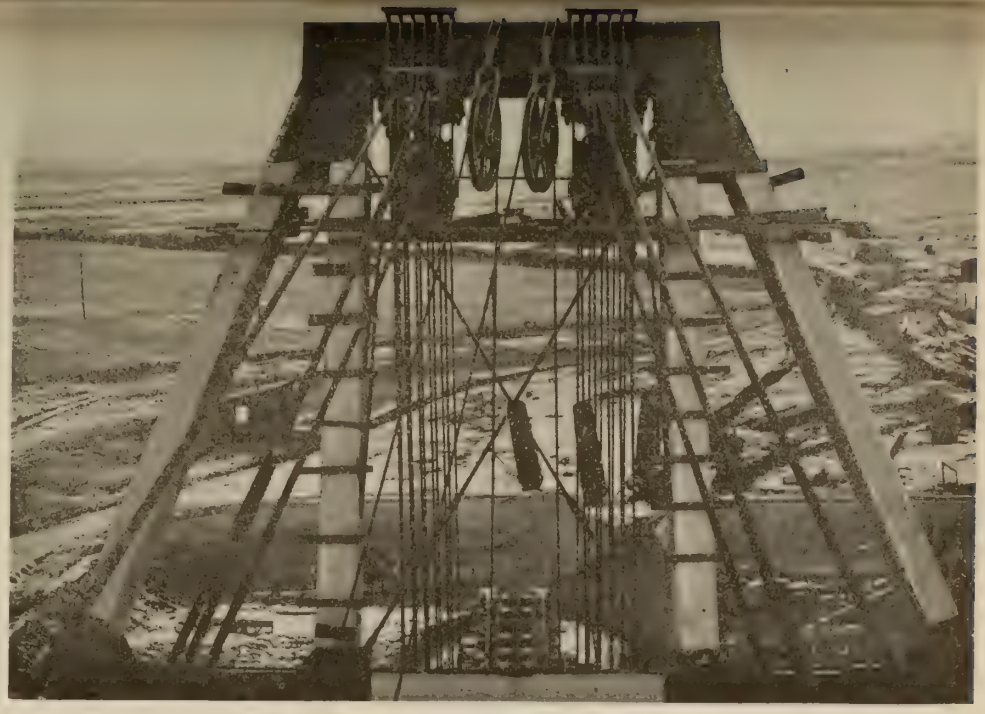
The bow gauntrees installed on the dredges of the Canadian Klondike Mining Co. are constructed of timbers fortified at all joints with steel plates, using a steel box girder type cap. The gauntrees are almost identically the same as those in use on large dredges in California. The stern gauntrees are constructed along the same lines as the bow gauntrees insofar as fortification is concerned, steel cap being used, and are similar to gauntrees in use in California.

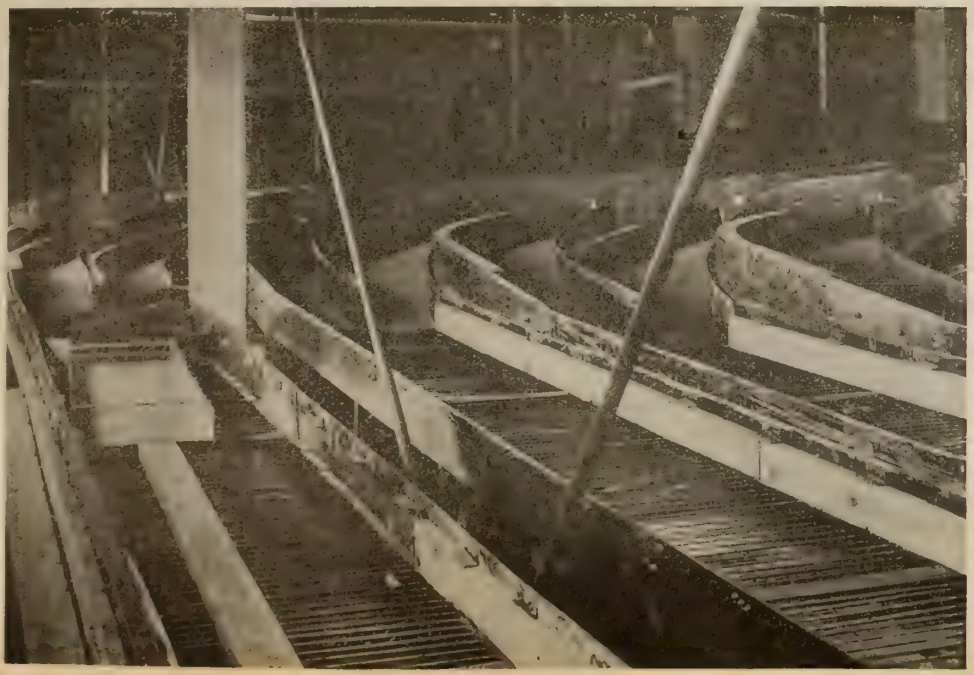
"Gold Dredging in California" contains the following information on the subject of gauntree construction: "The dredge hulls built during the last five years have greatly increased in weight, and are strongly braced with two overhead trusses extending the entire length of the boat on either side of the well-hole; also an overhead truss across the hull in the centre, which is attached to and distributes the loads upon the tumbler gauntree, thereby stiffening the hull fore and aft and athwartships. These trusses generally consist of 14 by 14-inch posts, having 14 by 16-inch cap stringers, and are braced by heavy steel diagonal truss rods between the posts."

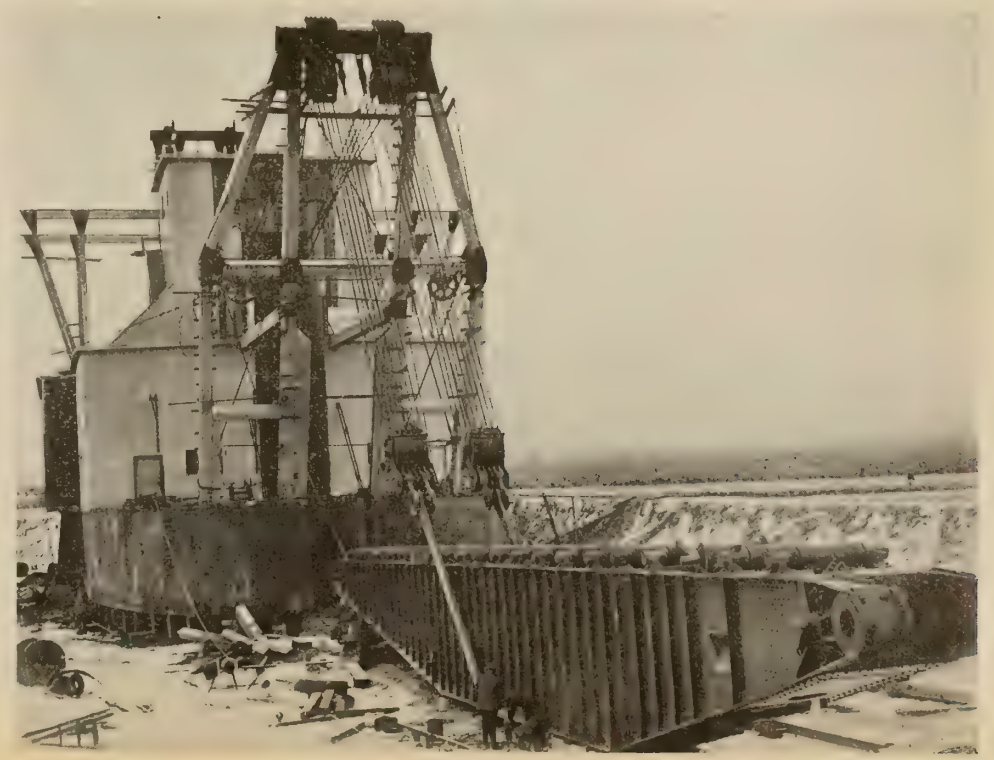
"To prevent the forward pontoon sections on either side of the well-hole from warping and sagging, which was a fault of the earlier boats, the bow gauntrees have been stiffened and redesigned to form a truss. The gauntree now consists of four posts 14 by 20-ins., rising about 36 feet above the deck, two being located on either side of the well-hole and two on the outside of the bow, well braced with steel rods and timber struts."

The middle or tumbler gauntree posts are 16 by 20 inches and of sufficient length to support the upper tumbler at a height of 23 to 25 feet above the deck. The stern gauntree posts are 14 by 16 inches and rise about 50 feet above deck resting on heavy timbers inside the hull.









The gauntree caps for the 5-cubic-foot and 7-cubic-foot machines are usually of timber, with steel side-plates the full length of the caps and extending down the gauntree posts, giving a substantial fastening to same. The larger machines are provided with structural steel caps.

**Main Drive and Upper Tumbler.**

The main drive, like all other machines on the 16-foot dredges of the Canadian Klondike Mining Co. is direct connected, the upper tumbler being driven by a 300 H.P. motor located on the main or upper tumbler gauntree, which is built of timber and heavy castings. These castings support the upper tumbler shaft the two intermediate driving shafts, the ladder suspension shaft, and also the bow gauntree guys. The castings are so constructed as to form when bolted together and connected with a large cast-steel plate that forms the foundation for the main drive motor, a solid bed plate for the entire drive.

The motor is mounted on the cast steel bed plate above mentioned and geared direct to the tumbler by means of a train of steel spur gearing, all gears having cut teeth. The upper tumbler shaft is 25 inches in diameter, reduced to 18 inches in diameter at the bearings, which are 30 inches long and hollow bored. The main drive gears are 14 feet in diameter, with a 12 inch face.

The second intermediate shaft is 14 inches in diameter with bearings 24 inches long. The intermediate gears are 91 1-2 inches in diameter with 10 inch face and the pinions meshing with the main gears are 26 inches in diameter.

The first intermediate shaft is 10 inches in diameter, fitted with a pinion at each end and near the middle carries a gear meshing with the pinion on the motor shaft. A friction clutch is mounted on this shaft for disengaging the motor and also acts as a slipping device.

**Equalizing Gear.**

The equalizing gear consists of bushing firmly keyed at quarters into the hub of the intermediate gear, this bushing at one end of the shaft being firmly keyed to the shaft, while at the other end two flat-backed keys are driven back to back, one into a key-way in the shaft, the other into a key-way in the bushing. These keys being 4 inches wide on the face, 1 1-2 inches thick and 24 inches long.

The gears are set as nearly perfect as possible and any slight inequality will adjust itself through the small allowance of slip by the keys and insures a perfect mesh of the gears on both ends of the shaft.

**Belts.**

The belt conveyor stacker of the 16-foot dredges is 48 inches wide by 238 feet long. The stacker is 115 feet in length. A straight idler is used with small idlers set at an angle at either end thereof, so as to create a concave form in the belt when running throughout the entire length of the stacker while carrying material, the driving drum on the other end of the stacker being straight and the belt returning on straight idlers.

The Canadian Klondike Mining Company use belts consisting of 8-plys of canvas with a convex reinforcement of rubber 5-16ths of an inch thick in the middle. When the belt shows appreciable wear in the middle, a 30-inch 7 ply rubber belt is attached in the form of a pad belt, which while running over the same drum on the outer end of the stacker has a separate idler set up on brackets at the lower end, same being separately adjustable, thereby insuring continuous running in the middle of the main belt.

The belting used by the Yukon Gold Co. is 32 inches wide, 7-ply; upper side has coating of 3-16 inch of rubber over 24 inches in the middle of the belt, tapering to 1-8 inch on edges. The average life of a belt is the period involved in handling about 1,000,000 cubic yards of material.

From the Canadian Klondike Mining Co., the following information has been obtained respecting: (a) clean-up, (b) materials resulting from clean-up, (c) melting, (d) gold saving devices, and (e) treatment of black sand:

**Clean-up.**

The gold saving system consists of a set of tables, made in the form of sluice boxes placed side by side on the foundation extending the entire length of the perforated portion of the screen, from the middle of the boat to each side, delivering into sluices running fore and aft and extending (in the case of the 16-foot boats) 30 feet beyond the stern.

At the head of the tables, on both sides of the screen, the first 42 inches of each sluice consists of a cocoanut mat on which is laid an expanded metal riffle, held firmly in place with wooden wedges. Below this set of riffles all sluices are fitted with angle-iron riffles with the angle bent slightly beyond 90 degrees for the purpose of creating a riffle at each angle.

The cocoanut mats are taken up each morning and replaced which operation takes from seven to fifteen minutes and is performed during the period in which the crew are oiling the lower tumbler, thereby causing no lost time.

A general clean-up takes place whenever the angle-iron riffles become filled to an extent which would in any way interfere with their ability to save gold, and in consequence the periods at which these clean-ups occur vary from once a week to twice a month, and are to some extent influenced by the question of repairs.

Immediately after the mats are changed and the oiling is completed, the dredge starts operating, and the clean-up crew proceeds to wash the mats in the tubs set up on each set of tables, piling the mats on a platform prepared for that purpose, ready to replace on the following morning those then in use. The material washed from the mats is run through a long-tom suspended from the ceiling over the tables, and over two sets of under-current riffles, the tailings from which are returned to the sluice tables of the dredge.

The long-toms are fitted with small cocoanut mats and expanded iron riffles, exactly similar to those installed at the head of the sluice tables, and after the material collected on the mats has been run through the long-tom, these mats are rolled up and taken to the clean-up room at the camp where they are washed, and the gold panned and blown, after which it is melted into small bricks for shipment to the mint. The tailings from pannings and blowings are amalgamated in a muller or grinding barrel, and when fully charged, the amalgam is retorted and the gold melted into bricks.

All sluices running athwart-ship on the dredges are 30 inches wide, stream-down sluices vary in width depending upon the number of athwart-ship sluices delivering into them, all sluices having a grade of 1 1-2 inches to the foot.

**Materials Resulting from Clean-up.**

With the exception of the silver contained in the particles of gold recovered, no material of value has

been found in the clean-up. A careful analysis was made of concentrates by fire assay and chemical and physical tests, and it was found that practically all of the gold was free; that the pyrites carried scarcely any gold; that the non-magnetic material consisted largely of quartz and ordinary alluvial rocky matter; and that the material which sank in bromoform consisted largely of cubes and fragments of yellow iron pyrites free from copper or arsenic. Small quantities of zircons were also found. No fluor-spar was found. No topaz was found either by chemical tests or microscopic examination, and it was decided that, with the exception of the gold, the material carried no commercial values.

**Melting.**

The treatment of gold dust is very simple as no attempt is made at refining the product, all of which is shipped to the Canadian mint.

The gold is melted in a plumbago crucible, the ordinary small open top furnace with gasoline jet being used. A flux of sodium carbonate (one part) and borax glass (two parts) is used and the melted gold skimmed with a small iron skimmer and poured into small bricks, which are then shipped by mail.

**Efficiency of Gold Saving Devices.**

It is impossible to say exactly what loss occurs in the process of winning the gold, but on one occasion it became necessary to dig through a considerable quantity of tailings already deposited by the dredge. Before entering the tailings the dredge was thoroughly cleaned and again carefully cleaned after reaching the other side. The recovery amounted to almost exactly 1-10 of 1 per cent of the amount recovered by the dredge when previously digging the same ground in its virgin state, and as nearly all of the gold recovered from the tailings was coarse it was assumed that it was gold which had passed through the dredge in chunks of bedrock which had been practically pulped together by the bucket lips in digging. At this particular place the bedrock consisted of decomposed schist, carrying considerable graphite, which when dug closely resembles clay and in many instances did not disintegrate on the screen. In consequence any gold contained within lumps which did not disintegrate would be carried out on the stacker, but as this particular bedrock when exposed to the weather for a season dries out, decomposes and washes readily, any gold which it contained would then be recovered.

Tests of tailings have been made by catching a tub of fine material from the stream-down sluices at the stern of the dredge, where they are returned to the pond, and with the exception of an occasional very fine color, no gold has been recovered, and in nearly every instance, although great care was taken in the panning, no recovery was made.

**Treatment of Black Sand.**

The black sand, and the very fine flour gold from which it is impossible to separate it by means of ordinary precipitation, are treated in a clean-up barrel or muller, which has a cement bottom, with a three-tooth grinder, the material being heavily charged with quick-silver and allowed to run for several hours, after which the amalgam is removed, retorted and the gold melted as already described.

The following notes were obtained from the Yukon Gold Company on the subject of the treatment of materials resulting from clean-up:

Clean amalgam is retorted directly and the quicksilver returned to the dredges. Cast-iron tube retorts holding five cast-iron-pans and heated by wood fire in a special brick furnace, are used. The retorted cake gold is broken by hammer and placed in a crucible heated in a gasoline furnace. The molten gold is poured in bricks, cleaned and weighed. Sampling is done by drilling and assaying by usual method.

Concentrates are amalgamated by putting them into a large cast-iron barrel with iron balls and revolving same for several hours. Water and sodium amalgam in quantity are present, and by this means the gold and lead are thoroughly amalgamated. This barrel then discharges slowly into a sluice through which water is pumped. The amalgam, lead, nails and iron remain in the sluice. These are removed, screened and washed after which the gold grains sink in quicksilver, and the base metals float. The two are separated and treated separately resulting in gold bullion and base bullion.

## HUDSON BAY RAILWAY.

Winnipeg, Man., Nov. 7.—Construction operations on the Hudson's Bay Railway and on the Port Nelson terminals have closed down for the year. Rails are laid as far as Kettle Rapids, in accordance with the program planned for this season. This is 330 miles north of The Pan. During the winter two bridges over the Nelson River will be completed and track-laying will be finished to Port Nelson early next summer.

## TORONTO UNIVERSITY AND THE WAR.

President Falconer of the University of Toronto in a recent interview said: "To impress the significance of this war on our students and as far as possible on the country about us is our chief object just now. At the beginning of the present term we had the names of 3,041 Toronto graduates and undergraduates who were on active service. Ninety members of our staff are in khaki, and these have not been replaced. Their work is being done in the classrooms by their colleagues, who are doubling their regular academic duties. Our Department of History has lost its entire staff of lecturers, two of whom have won Military Crosses. The English Department has given up one of its professors as a training officer. Modern languages are being taught by a greatly reduced staff. Two of our men from the Physics Department are doing X-ray work for the British Government. In the Department of Mineralogy we have a Belgian scientist, who was driven from his native university by the Germans, and he is here now, as the guest of the staff of our university. In chemistry we have also lost two professors, who are serving the purposes of the war. The Faculty of Medicine, of course, is represented on the western and Balkan fronts by the very best of its men. The Base Hospital at Saloniki, for example, is manned entirely by Toronto professors and graduates, and it is gratifying to know that they are doing such magnificent work off there in Greece. The women of the university have done noble work in helping to equip the hospital at Saloniki, and now they have turned their efforts towards helping the Red Cross organization."

## BEAVER.

Cross cutting on the 1,600-foot level is proceeding without interruption, and several veins, very familiar in character to those worked above the diabase sill, have been encountered. No drifting has as yet been done, but cross cutting will be continued until the ground is thoroughly blocked out.

## INCREASE IN WAGES TO THE WORKMEN OF THE DOMINION COAL COMPANY, AND THE DOMINION IRON AND STEEL COMPANY.

Further enhancement of the cost of living has necessitated the further increasing of the wages paid in the coal and steel industries.

In May last the Dominion Coal Company gave its workmen at the collieries an increase of ten per cent., of which increase six per cent. became effective on the 1st of June, 1916, the remaining four per cent. being given on the 1st of January, 1917. The Dominion Coal Company had an agreement with the Provincial Workmen's Association covering a period of three years, which expired at the end of 1916, and provided for no change in wages until that date. As, however, it has always been the basis of these long term contracts that general conditions remained unaltered, the workmen felt that the sudden and large increase in the cost of living entitled them to ask for consideration of this fact. The company recognized the justice of these representations, and gave the aforesaid increase of ten per cent. The company thus anticipated the expiry of the contract by six months, and concluded a new agreement holding until the end of 1918, giving a ten per cent. increase on the wages paid under the old agreement, but anticipating six per cent. of this by six months, in consideration of the increased cost of living.

As, however, the upward tendency of all classes of goods has continued, the workmen again approached the company, and asked for further increase in wages.

After negotiations with the representatives of the Provincial Workmen's Association, the company has announced the following increases, effective 1st November, namely, a ten per cent. increase on all wages at the collieries, as a "war bonus"; anticipation of the four per cent. increase due at the 1st of January, which instead becomes effective at the 1st of November, plus a five per cent. bonus for steady work, which will be paid on the earnings of all underground producers who work 22 days out of each four weeks working period. Counting the increase of six per cent. given in June, the workmen have therefore been given a total increase of 21 per cent. on the wages under the old agreement, and where a man earns the five per cent. bonus for steady work, his wages are increased 26 per cent. over the rates of last May.

Such an increase is unprecedented in the history of coal mining in Nova Scotia, and could only be justified by abnormal conditions.

In addition to granting the aforementioned advances in wages, the Coal Company undertakes to keep the price of coal and rent to its employees at the existing low figures, and it is further endeavoring to maintain some equilibrium in the cost of living by making judicious advance purchases of the necessities of life, for retail through its company stores.

This attitude on the part of the company is one that shows a commendable solicitude for the welfare of its workpeople, because the company's position is beset with many other serious troubles.

Owing to the heavy enlistment drain, the company has lost 4,500 workmen out of the maximum force of 11,500 men. This loss has been almost entirely among the underground producers, and of course the men who have gone were in every respect the pick of the workers. Production of coal has dropped about forty per cent., thereby reducing the tonnage of coal on which profits can be made, and increasing the overhead charges. Any increase in the price of coal which has been obtained is swallowed by the increases in the cost of transportation. Freighting costs, as is well known, have soared to heights not previously dreamt of, and charter-rates are increased about one thousand per cent.

All classes of pit material have advanced in price, and the company has found it necessary to carry the burden of the increase in the cost of explosives, which it is now supplying to its workmen at prices very much less than the maker's price. For example, the cost of detonators has increased about 300 per cent.

There is only one way out of these difficulties, and that is an increase in the selling price of coal. Shortage of labour, high cost of transportation, high cost of all materials, actual shortage of coal supply when compared with the requirements of the country, and increased wages, are a combination which will compel an increase in the selling price of coal, for which the public must prepare itself.

The same conditions that have rendered an increase to the coal miners necessary are operating in the steel trade, and simultaneously with the increase given to the miners, the Dominion Iron & Steel Company have announced an increase of ten per cent. on all tonnage and day rates paid at the Steel Works, effective 1st of November, 1916. This increase follows a ten per cent. advance given in May last, and is equivalent to an increase of 21 per cent. on the wages of the steel workers when compared with those paid in May last.

## DOMINION STEEL.

Mr. Mark Workman, president of the Dominion Steel Corporation, returned to Montreal last week from an inspection trip over the properties of the corporation in Cape Breton, says The Montreal Star.

Mr. Workman was accompanied by D. H. McDougall, general manager, and was very much impressed with the improved conditions at Sydney as regards organization. The appointment of Mr. McDougall some months ago has co-ordinated the activities of the Dominion Iron and Steel and Dominion Coal Companies, resulting in greatly increased efficiency.

Since that time, efforts have been directed towards the upbuilding of an efficient administration at Sydney. As a result of this R. F. Randolph and W. H. Bishop have recently allied themselves with the activities of the Dominion Steel Corporation, the former as general superintendent of the steel works, and the latter as steel expert. Both these gentlemen have for several years past occupied similar positions with the Bethlehem Steel Co. of Bethlehem, Pa.

Mr. Bishop assumes the title of assistant general superintendent, and takes charge of the coke ovens, blast furnaces and open hearth departments. A further change has been made by promoting H. E. Rice to the position of assistant general superintendent, his jurisdiction to extend over the various mills of the steel company. George D. Macdougall, mechanical superintendent of the steel works, has also received promotion, having now assumed the position of chief engineer. Several other changes have been made of somewhat lesser importance.

President Workman states that in recognition of the higher cost of living, a voluntary increase in wages in the form of a war bonus has been recently granted to the corporation's many employees, making the second advance since the beginning of the current year. He further stated that he was extremely gratified with the output of the steel works, every department of which is at the present time operating to full capacity.

## REFINING ZINC AND COPPER AT TRAIL.

The circular to the shareholders of the Consolidated Mining and Smelting Company of Canada, Limited, setting forth the reasons for the new stock issue in detail, is as follows:—

"To provide the requisite additional permanent capital to meet the expenditure involved in the enlargement of your plant at Trail and the increasing mining activities of the Company, your directors have resolved to increase the share capital by one-quarter.

"Early this year at the request of the Imperial Munitions Board your company undertook additional contracts of considerable magnitude for high grade zinc to be supplied to the Allied Governments. While a portion of the cost of the plant requisite for manufacturing this zinc was advanced by the Governments, your company was required to substantially supplement the amount.

"The copper refinery has been increased in capacity.

"Plants for the production of both sulphuric and hydro-fluo-silicic acid have been installed so as to make your refining operations independent of an uncertain and expensive supply.

"Because of the further zinc contracts undertaken and the extensions in your plant, various changes and enlargements have been necessary to bring the smelter up to the increased demands upon it.

"War conditions have increased the cost of construction very materially over the original estimates.

"Your mining operations are being extended and will be further extended. An option has been taken upon a copper property of large possibilities at the north end of Vancouver Island, close to tide-water. Development of this property is now proceeding. Other properties are being examined, some of which no doubt will be taken over. As there has not been, and as there is not likely to be for some time any cessation in the development of your properties already being worked, these new properties, as acquired, will need substantial expenditure on capital account before they are on a shipping basis.

"Producing at one place and on a fairly large scale, as you do, no less than five refined metals (i.e., gold, silver, lead, zinc and copper), your capital, even with the increase resolved upon, is moderate. In fact, it is small as compared with the capital of many United States companies engaged in much more restricted operations.

"The annual stock-taking is now in progress. The usual dividends have been earned together with a fair surplus for profit and loss account. During the past year the operations of the smelter and refinery were affected by heavy and continuous construction work and by very great increases in the cost of both labor and supplies.

"Your zinc plant has already produced and shipped a considerable amount of refined product and regular shipments are now going forward which should gradually increase in volume.

"In connection with the increase of capital each shareholder of record at the close of businesss on the 21st day of October, 1916, will have the right to subscribe at par for one share for every four shares then held by such shareholder. The right to subscribe will expire at noon on the 1st day of December, 1916.

"No subscription for a fraction of a share will be recognized and no fractional share will be allotted, but certificates of rights to subscribe will be issued, and fractional rights may be added together for the purpose of subscriptions for full shares.

"Failure to pay any instalment on or before the date it is due renders previous payments liable to forfeiture.

"Subscribers may pay all or any installments in advance. All shares paid for in full on or before January 1st, 1917, will rank for dividend thereafter. Shares paid for in installments will rank for dividend only after April 1st, 1917.

"The directors reserve the right to extend the times fixed for subscription and payment in the case of any shareholders residing outside of Canada who may not have received sufficient notice to enable them to exercise their rights."

## COBALT SHIPMENTS.

Cobalt, Nov. 4.—The Cobalt companies made a big showing for the past week in ore shipments. These were away above normal, a total of 1,153,807 pounds being sent out. Nipissing led with 348,660 pounds, some of which was sent to Welland, Ont., and the remainder to Birmingham, Eng. The Dominion Reduction and Trethewey and Kerr Lake shipped to United States smelters.

Bullion shipments for the same period were:

| Company. | Ounces. | Value. |
|---|---|---|
| Mining Corp. | 50,160.34 | $34,359.83 |
| Nipissing | 144,116.47 | $99,449.36 |

Ore shipments for the week ending last night were as follows:

| Company. | Pounds. |
|---|---|
| Nipissing | 348,660 |
| Kerr Lake | 60,455 |
| Dom. Red. | 146,000 |
| Coniagas | 249,400 |
| McKinley Darragh | 165,535 |
| Buffalo | 63,385 |
| Trethewey | 41,010 |
| Hudson Bay | 79,362 |
| Total | 1,153,807 |

## INTERNATIONAL NICKEL CO.

When its proposed construction and improvement work in Canada has been completed, the International Nickel Co. will have increased its capacity approximately 40 per cent., or from an annual output of 60,000,000 pounds of nickel to between 80,000,000 and 90,000,000 pounds.

Original plans called for the expenditure of $2,000,000 on a Canadian refinery. The management, however, decided later to increase facilities all along the line through a single appropriation of $5,000,000. Smelting facilities at the Canadian Copper works will be enlarged and water power capacity increased.

International Nickel Co. has between $8,000,000 and $9,000,000 cash and securities, including $2,000,000 Anglo-French bonds.

International Nickel handles about 850,000 tons of ore annually, running consistently about 4½ per cent nickel. Copper values average about one-half nickel content, or 2¼ per cent. The company saves about 92 per cent. of its nickel.

The nickel to be turned out in the Canadian plant will amount to from 20,000,000 to 30,000,000 pounds a year. With an increase in nickel output, copper production is expected to increase from about 30,000,000 pounds to better than 40,000,000 pounds per annum.—Boston News Bureau.

# PERSONAL AND GENERAL

Mr. David Sloan has returned from Arizona and is now at Matheson, Ont.

Mr. W. F. Ferrier has returned to Toronto from British Columbia.

Dr. A. W. G. Wilson has been in Toronto recently in connection with the manufacture of steel-coated shrapnel bullets.

D. H. Symmes of Niagara Falls, Ont., has been elected a director of McIntyre-Porcupine Mines, Ltd., succeeding I. J. R. Muurling of New York, who resigned.

Mr. Geo. Watkin Evans, has returned from his Alaskan trip to his Seattle office.

Mr. H. J. Stander, of Brunswick, Ga., will superintend experimental flotation work for the Mond Nickel Co. at Coniston, Ont.

Mr. C. H. Withers has been appointed manager of Messrs. Escher Wyss & Co.'s head office for Canada in Montreal.

Mr. Stanley Anthony, who is now on the electrolytic zinc staff of the Consolidated Mining and Smelting Co. at Trail, B.C., beside having had other connections in the Northwest as a metallurgical chemist, was engaged at the Silica mill, near Rossland, when, some years ago, much experimental and metallurgical research work was done at that plant.

Mr. C. J. Seymour Baker, of Barkerville, Cariboo, has left British Columbia for England to spend the winter in the Old Country.

Mr. H. Foster Bain, editor of The Mining Magazine, published in London, England, arranged to sail on November 2nd by the S.S. Empress of Japan from Vancouver, B.C., for China.

Mr. Frederick Bradshaw, of Tonopah, Nevada, general superintendent for the Tonopah-Belmont Co., has been at the company's Surf Inlet gold mine, on Princess Royal Island, British Columbia.

Dr. D. D. Cairnes, of the Geological Survey of Canada, was in White Horse, Southern Yukon, at the end of September, and went thence to Atlin, B.C. It was his intention to leave for Ottawa about the middle of October.

Mr. W. A. Carlyle is resident director in Ontario for the British-America Nickel Co. It is stated that the chief object of his recent visit to Montana was to make final arrangements with Mr. E. P. Mathewson, of the Anaconda Mining Co. to become general manager for the British-America Nickel Co.

Messrs. Edwin E. Chase and son, of Denver, Colorado, have been visiting mining properties in British Columbia.

Mr. J. H. Cunningham, of Ladysmith, B.C., manager of the Canadian Collieries (Dunsmuir) Ltd.'s Extension colliery, near Ladysmith, Vancouver Island, left that town about October 11 to pay a visit to his old home in Nova Scotia.

Mr. Ed. Dedolph returned to Kaslo, Kootenay lake, B.C., from Spokane, Washington, last month, negotiations for the establishment in West Kootenay, B.C., of a new zinc reduction works, with which he was to be officially connected, having come to an end for the time.

Dr. Chas. W. Drysdale, and Mr. M. N. Bancroft, of the Geological Survey of Canada, were in Slocan district of British Columbia early in October.

Dr. W. F. Ferrier, of Toronto, who has been examining mineral claims in British Columbia on which antimony-bearing ore occurs, early last month paid a visit to the Alps-Alturas mine, situated high up in mountains in the neighborhood of Three Forks, Slocan district. He has since returned to Ontario.

Mr. Thos. French, manager for the French Complex Ore Reduction Co., has returned to Nelson, B.C., from a visit to St. Louis, Missouri, and other United States manufacturing centres, whence he had been to try to hasten shipment of machinery and plant for the electrolytic zinc reduction works his company is equipping at Nelson.

Mr. A. C. Garde, of Prince Rupert, B.C., acting for Mr. C. H. Sproat, of Portland, Oregon, who has bonded a mining property situated within a few miles of Evelyn, in Omineca mining division, a small station on the Grand Trunk Pacific railway, 217 miles east of Prince Rupert, is directing the work of a few men engaged in developing some silver-lead ore occurring on the property.

## STEEL PRICES.

New York, Nov. 4.—Advance to a new high in average price of eight leading steel products this week 25 cents a ton, to $64, compared with $63.75 a week ago, was due to advance of $2 in bessemer pig iron at Pittsburgh to $26.95 per ton, against $24.95 last week.

Price changes have been witnessed during the week in a number of products not included in the eight from which the average is obtained. The following shows the most important of these changes.

| | Nov. 2 | Oct. 20 |
|---|---|---|
| No. 2 iron, valley furnace (per ton). | $23.00 | $21.00 |
| No. 2 iron, Cincinnati ..... | 19.90 | 18.90 |
| No. 2 iron, Birmingham ..... | 17.00 | 16.00 |
| Basic iron, valley furnace ..... | 22.00 | 20.00 |
| Malleable bessemer iron, Chicago.. | 24.00 | 21.50 |
| Gray forge iron, Pittsburgh ..... | 22.95 | 20.95 |
| Forging billets, Pittsburgh ..... | 75.00 | 73.00 |
| Wire rods, Pittsburgh ..... | 60.00 | 55.00 |
| Iron bars, Pittsburgh (per 100 lbs).. | 2.85 | 2.75 |
| Skelp, grooved steel, Pittsburgh.... | 2.70 | 2.50 |
| Skelp, sheared steel, Pittsburgh.... | 2.80 | 2.60 |
| Galvanized sheets, Pittsburgh ..... | 4.90 | 4.75 |

Prices for old material have also moved up 50 cents to $1.50 per ton. Discounts on lap-weld iron and steel pipe and on woven wire fencing were reduced one point, representing an advance of $2 a ton.

## PLATINUM IN MANITOBA ORES.

The Pas, Man., Nov. 3.—The latest news from the Northern Manitoba Mining and Development company's property is that the shaft is down forty feet, and the ore still showing up good. A picked sample from McCafferty's vein shows $49 in gold and $17 in platinum. This shows that the platinum is widely distributed, as it is five miles between McCafferty's and the N. M. M. & D. Co.'s property, which also carries platinum.

Samples from the Rex and Elizabeth mines are now being tested for platinum, and should give further information on the subject.

It is said that R. J. Jowsey and associates will take up their option on the Kiski group.—The Pas Herald.

## GOWANDA.

The Miller Lake-O'Brien find is proving to be one of great importance. Development work has disclosed a large body of rich ore.

## THE UNION DRAWN-STEEL CO.

The Union Drawn Steel Co., Beaver Falls, Pa., manufacturer of cold drawn steel, in shafting and other forms, is building a plant at Gary, Ind., which is expected to be in operation about Jan. 1. The plant will be of steel and concrete, two stories, 150x456 feet and will be equipped to turn out a full line of this class of goods to supply the western trade. Its location is close to the plant of the Illinois Steel Co. at Gary and railroad service is excellent.

Special machinery for producing cold drawn steel is being built at Beaver Falls for installation at Gary, as this form of equipment is not available in the market.

The company now operates two plants at Beaver Falls and one at Hamilton in Canada, the Gary plant being the fourth in its chain.

## MANNESMANN TUBE.

The anglicising movement which has absorbed so many German works in Great Britain has resulted in the transfer to British owners of the German interest in the British Mannesmann Tube Co., Ltd., Swansea, Wales. The German shares in this company have now been sold by the public trustee to a British group of capitalists, which includes Sir Hugh Bell, A. J. Dorman, Balfour Williamson & Co., and Higginson & Co. It will be seen that this group includes some of the best known steel magnates in Great Britain.

The transfer of the shares was taken under the trading with enemy act of 1916, which gives the board of trade power, when there is a predominant enemy interest, either to wind up the firm, or to vest the enemy interest in British hands. The enemy shares were put up to open tender. There were only four British buyers, but the price paid was considerably in excess of that for which the owners were prepared to sell at the outbreak of the war.

## BOOK REVIEWS.

**Metallurgists' and Chemists' Handbook**—By Donald M. Liddell—Published by McGraw-Hill Book Co., New York—Price $4.00—For sale by Book Department, Canadian Mining Journal.

This is a compilation of useful tables. The several sections are headed: Mathematics, Price and Production Statistics, Physical Constants, Chemical Data, Sampling, Assaying and Analysis, Ore Dressing, Cyanidation, Fuels and Refractories, Mechanical Engineering and Construction, General Metallurgy, First Aid. Under these headings the chemist and metallurgist will find 588 pages of valuable data.

## ARTIFICIAL GAS.

The use of artificial gas as a domestic and industrial fuel is increasing. In households gas is replacing coal for cooking and to some extent for heating, and in the industries gas—mainly that from by-product coke ovens—is now used for raising steam and firing open-hearth steel furnaces. The advantages of gas as a fuel, not the least of which are its cleanliness and its ease of control, are well known, and it is being supplied to many small cities and towns by pipe lines from the larger cities where it is made. The use of artificial gas for illuminating, however, is decreasing, mainly because of competition by electricity.

Water gas enriched with oil—carburetted water gas—is more generally used in cities than coal gas.

## NIPISSING.

The location of a new ore shoot in Vein 490 is proving to be one of the most important finds ever made on the company's ground. It is estimated that development so far done on this ore shoot has added 1,000,000 ounces of silver to the ore reserves. There are good possibilities for other veins in the immediate vicinity, as several cross veins have already been encountered in the 490 drifts.

## IN DELORO.

A diamond drill is in operation on the Thomas claims, Deloro township.

The Coniagas company is continuing work on the Anchorite property and the La Rose has been granted an extension of its option on the Maidens-McDonald. These properties adjoin and the activities of the two companies should result in careful testing of this area.

A representative of New York capitalists, Mr. Edward Hinman, Jun., is stated to have bonded a group of mineral claims on Ecstall river, in Skeena mining division, which stream flows into the Skeena river near its mouth, at Port Essington.

## TORONTO MARKETS.

Cobalt oxide, black, $1.05 per lb.
Cobalt oxide, grey, $1.15 per lb.
Cobalt metal, $1.25 to $1.50 per lb.
Cobalt anodes, $1.50 to $1.75 per lb.
Nickel metal, 45 to 50 cents per lb.
White arsenic, 5½ to 6 cents per lb.

Nov. 8.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 15 cents per lb.
Lead, 9 cents per lb.
Tin, 45 cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 29 cents per lb.
Electrolytic, 31½ cents per lb.
Ingot brass, yellow, 17½ cents; red, 20½ cents per lb.

Nov. 8.—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $9.00 per ton.
Coal, bituminous, $10.00 per ton.

## SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| October 20th | 67⅜ | 32⅛ |
| " 25th | 67⅜ | 32⅛ |
| " 26th | 67⅜ | 32⅛ |
| " 27th | 67⅜ | 32⅛ |
| " 28th | 67⅝ | 32¼ |
| " 30th | 67¾ | 32¼ |
| " 31st | 68⅛ | 32½ |
| November 1st | 68⅛ | 32½ |
| " 2nd | 68⅛ | 32 7/16 |
| " 3rd | 68⅛ | 32½ |

## MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% $MoS_2$, $13.00 per unit.
Ores carrying between 3% and 5% $MoS_2$, $14.50 per unit.
Ores carrying between 5% and 10% $MoS_2$, $16.00 per unit.
Ores carrying between 10% and 15% $MoS_2$, $17.00 per unit.
Ores carrying between 15% and 20% $MoS_2$, $18.00 per unit.

80% concentrates $1.00 lb. of $MoS_2$.

Penalties imposed for copper and bismuth.

# MARKETS

## NEW YORK MARKETS.

Nov. 14.—Connellsville Coke—

Furnace, spot, $7.25 to $7.75.
Furnace, contract, $3.75 to $4.00.
Foundry, prompt, $8.00 to $9.00.
Foundry, contract, $5.00 to $6.00.
Straits tin, f.o.b., 42.12½ cents.

Copper—

Prime Lake, nominal, 28.37½ to 28.62½ cents.
Electrolytic, nominal, 28.75 to 29.25 cents.
Casting, nominal, 27.50 to 27.75 cents.

Lead, Trust price, 7 cents.
Lead, outside, 7 to 7.12½ cents.
Spelter, prompt western shipment, nominal, 10.67½ to 10.80 cents.

Antimony—

Chinese and Japanese, 12.87½ to 13.12½ cents.
American, nominal.

Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 64 to 66 cents.
Pure, 98-99 per cent. remelt, 58 to 60 cents.
No. 12 alloy remelt, 45 to 47 cents.
Powdered aluminum, $1.00 to $1.15.

Metallic magnesium, 99 per cent. plus, $3.50.

Nickel—

Shot and ingot, 45 cents.
Electrolytic, 50 cents.

Cadmium, nominal, $1.45 to $1.50.

Quicksilver, $80.

Platinum, $90.

Cobalt (metallic), $1.25.

Silver (official), 68⅛ cents.

Metal Products—Following base prices represent the outside market except where otherwise specified and are entirely nominal except in the case of lead sheets and sheet zinc:

Sheet copper—

Hot rolled (f.o.b. mills), 37.5 cents.
Cold rolled (f.o.b. mill), 38.5 cents.

Copper in rods, 43 cents.

Copper in rolls, 40 cents.

Copper wire (f.o.b. mill), 33.25 cents.

Copper wire (f.o.b. mill), December, 32.75 cents.

High brass—

Sheets, 42 to 46 cents.
Wire and light rods, 45 to 48 cents.
Heavy rods, 41 to 45 cents.

Tubing—

Brazed brass, 45 to 50 cents.
Brazed brass (f.o.b. mill), 43.75 cents.
Seamless copper, 47 to 49 cents.
Seamless brass (f.o.b. mill), 46 to 48 cents.

Naval bronze—

Rods (f.o.b. mill), 40 cents.
Sheets (f.o.b. mill), 41.50 cents.

Muntz metal—

Rods, 38.5 cents.
Rods (f.o.b. mill), 36.5 cents.
Sheets, 42 cents.
Sheets (f.o.b. mill), 40 cents.

Full lead sheets (f.o.b. mill), 8.5 cents.
Cut lead sheets (f.o.b. mill), 8.75 cents.
Sheet zinc (f.o.b. smelter), 16 cents.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)
As of close November 8th, 1916.

### New York Stocks.

| | Bid. | Asked. |
|---|---|---|
| Can. Car. | 30.00 | 40.00 |
| Curtiss Aeroplane | 15.00 | 30.00 |
| Can. Copper | 2.12 | 2.25 |
| Canada Cement | 68.50 | 69.00 |
| Con. Ariz. | 2.87 | 3.00 |
| Emma Copper | 2.37½ | 2.50 |
| Howe Sound | 5.50 | 6.00 |
| Inter. Nickel (new) | 51.25 | 51.38 |
| Kennecott Copper | 55.12 | 55.37 |
| Maxim Munitions | 7.25 | 7.75 |
| Midvale Steel | 70.25 | 70.37 |
| Mother Lode | 37.00 | 38.00 |
| Steel of Canada | 77.00 | 78.00 |
| Submarine Boat | 42.00 | 44.00 |
| Tonopah Extension | 5.62½ | 5.84½ |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex. | .08⅝ | .09 |
| Dome Extension | .30 | .31 |
| Dome Lake | .58 | .58½ |
| Dome Mines | 24.00 | 25.50 |
| Foley O'Brien | .72 | .81 |
| Hollinger. | 6.85 | 6.90 |
| Homestakes. | .60 | ... |
| Jupiter | 27½ | .29 |
| McIntyre | 1.80 | 1.81 |
| McIntyre Extension | .43 | .45 |
| Moneta. | .15 | .16 |
| Porcupine Crown | ... | .72 |
| Porcupine Imperial | .03¾ | .03⅞ |
| Porcupine Vipond | .41 | .42 |
| Preston East Dome | .04⅛ | .04¼ |
| New Ray | .99 | 1.01 |
| Teck Hughes | .41 | .45 |
| West Dome | ... | .34½ |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac. | ... | .33 |
| Bailey. | .08 | .08½ |
| Beaver | 40 | .42 |
| Chambers Ferland | .18 | .19 |
| Coniagas | 4.75 | 5.00 |
| Crown Reserve | .47 | .48 |
| Foster. | ... | .07 |
| Gifford | .03¾ | .04 |
| Gould | ... | .00⅜ |
| Great Northern | .09¾ | .10 |
| Hargreaves. | .02¾ | .03½ |
| Hudson Bay | ... | .75 |
| Kerr Lake | 4.75 | 4.85 |
| La Rose | .55 | .60 |
| McKinley. | .59 | .63 |
| Nipissing. | 8.35 | 8.60 |
| Peterson Lake | 18 | .18¼ |
| Right of Way | .05 | .06 |
| Seneca Superior | ... | .09 |
| Shamrock Cons. | .15¼ | .15¾ |
| Silver Leaf | .01¼ | .02 |
| Temiskaming | .62 | .62½ |
| Trethewey | .16 | .17½ |
| Wettlaufer. | ... | .11 |
| Vacuum Gas | 1.09 | 1.10 |
| Inspiration | .24 | .24½ |

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## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 5
Armstrong, Whitworth of Can., Ltd. . . . . 10

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
Beatty, M. & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
Berger, C. L. & Sons . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd. . . . . 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co. . . . . 6
Canadian Explosives, Ltd. . . . . 14
Canadian Industry, Commerce and Finance. . . . . 3
Can. Ingersoll-Rand Co., Ltd.... 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. . . . . 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Concentrating Ores by Flotation 4
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . .Outside Back Cover

D

Dept. of Mines, Canada. . . . . .Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd. . . . . 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fraser & Chalmers, Ltd. . . . . 4
Fuller, A. S. & Co. . . . . 12

G

Gartshore, J. J. . . . . 4

H

Hassan, A. A. . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11

I

Imperial Bank of Canada . . . . . 6
Industrial & Technical Press.... . . . . outside back cover
International Molybdenum Co. .. 6
International Nickel Co. . . . . 6

J

Johnson, Matthey & Co. . . . . 11

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

Mines Handbook . . . . . 2
Murphy, Chas. J. . . . . 11
Mussens, Ltd. . . . . 10

N

Nova Scotia Steel & Coal Co.... 4
Nova Scotia, Province of.... 8
Northern Canada Supply Co., Ltd. 7

O

Ontario, Province of . . . . . .Inside Back Cover

Q

Quebec, Province of . . . . . 8

S

School of Mining . . . . . 5
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 11
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2

T

Tyrrell, J. B. . . . . 11

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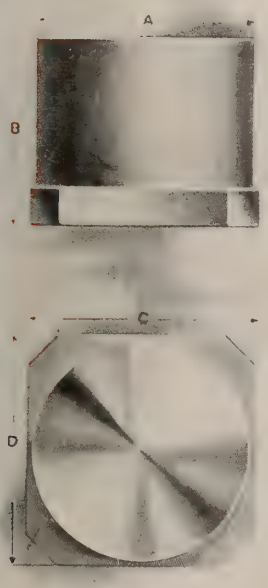
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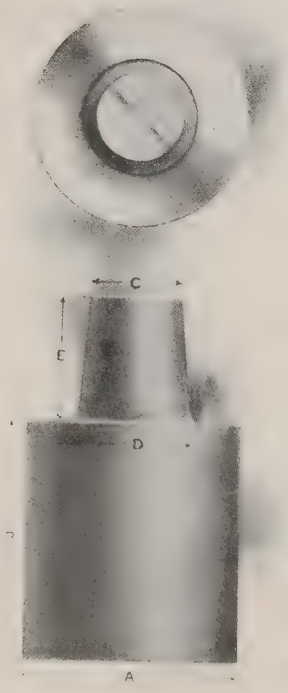
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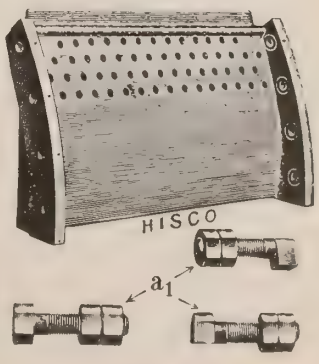

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## MINES BRANCH

### Recent Publications

The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

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Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

## GEOLOGICAL SURVEY

### Recent Publications

Summary Report of the Geological Survey for the Calendar Year 1915.

Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 78. Wabana Iron Ore of Newfoundland, by A. O. Hayes.

Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Map 59A. Wheaton, Yukon Territory.

Map 150A. Ponhook Lake Sheet, Nova Scotia.

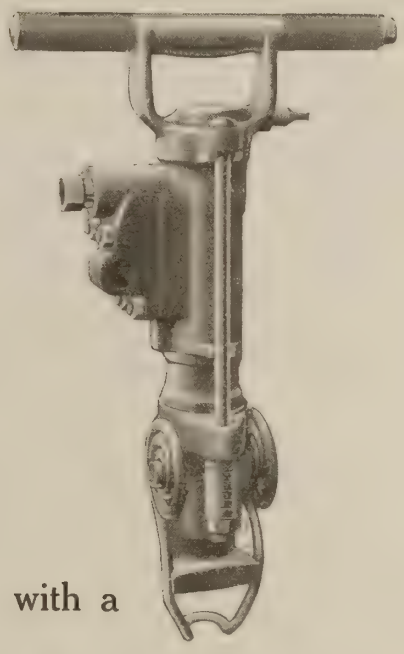
Map 160A. Manaimo Sheet, Vancouver Island.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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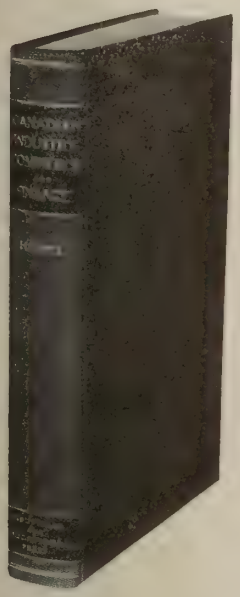
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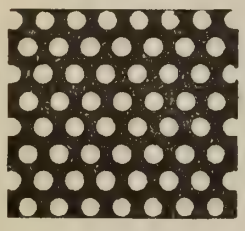
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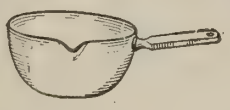
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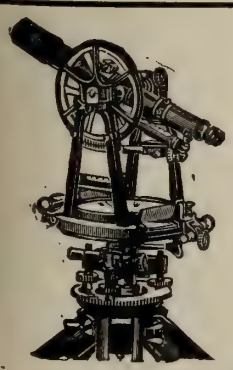
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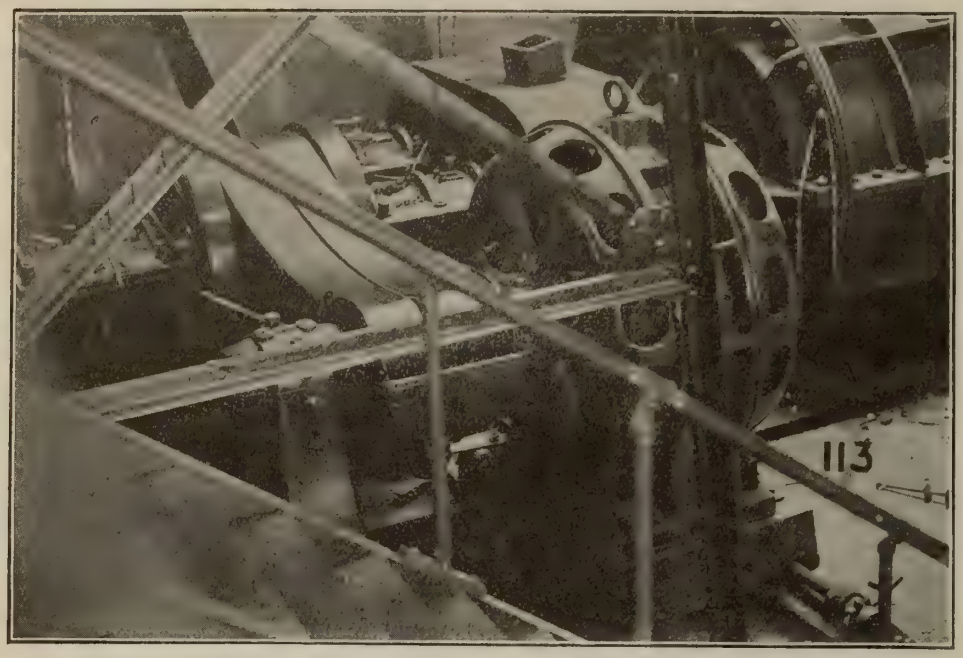
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, December 1, 1916. No. 23

## The Canadian Mining Journal

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CONTENTS

| Editorials— | Page |
|---|---|
| The International Nickel Company | 551 |
| German Control of Metals | 552 |
| Our Exports | 552 |
| American Sources of Nickel | 553 |
| Is Canadian Nickel Being Shipped to Germany? | 553 |
| Chromium | 553 |
| Mining and Industrial Research. By T. L. Walker | 556 |
| Large Increase in Ontario's Metal Production | 555 |
| The Cost of Coal. By G. O. Smith and C. E. Lesher | 557 |
| The Weathering of Coal. By J. B. Porter | 560 |
| Mine Earnings | 564 |
| English and Engineering | 566 |
| Cost of Dredging in Yukon | 568 |
| Personal and General | 570 |
| Special Correspondence | 571 |
| Markets | 574 |

## THE INTERNATIONAL NICKEL COMPANY

During the past two years the International Nickel Company has been repeatedly unjustly attacked by certain persons in Canada. It is refreshing therefore to read such statements as that of Solicitor-General Meighen who said, in Toronto, on Thursday, November 24th, that in connection with the checking of the destination of nickel exported from Canada, that our Government had from the beginning of the war met with friendly co-operation from the officials of the company. "It has been said, although I have never heard anything in support of the allegation," said Mr. Meighen, "that this is a German company with an American or English veneer. If it were a German company, then Germany and its friends had enough money to stop production at that refinery. I think a little common sense will teach any reasonable man that, whatever else is said, it cannot be said that German influence has had any effect."

Mr. Meighen has said some foolish things about nickel during the past year, but we believe that his statements concerning the International Nickel Company are correct.

The Canadian Mining Journal has repeatedly stated that no sufficient reason has been given for the charges made against the International Nickel Company. We are pleased to see that the Solicitor-General has in fairness to the company given out a statement of the facts. It is all very well to avoid giving out information that would be useful to the enemy, but if unscrupulous politicians in Canada were allowed to go on unchecked more harm would be done than by imparting some information to the people.

The International Nickel Company is controlled by Americans who have no desire to be classed with the Huns. The company is doing very useful work at a critical time. The directors of the company know, as our readers know, that many of the nasty statements about nickel export, made by some of our Toronto politicians and newspapers are false. Some of these statements we have undertaken to dispute in these columns. The continued activity of the politicians and the widespread publicity given to their false statements has doubtless led the Government to state some of the facts. We believe that when all is told it will be found that the International Nickel Company has been very unfairly criticized. In the meantime the company will have to be satisfied with its handsome profits and the knowledge that those in Canada best acquainted with the facts know that the criticism is unjust.

We are in favor of having all our nickel refined in Canada, and we will be pleased if arrangements can be

made so that the International Nickel Company will decide to do all its refininig here. The company's record is a clean one and the only fault we find with it is that its operations are not all carried on in Canada. We look with favor on the agitation for home refineries but we object to the publicity given to false charges against the company.

## GERMAN CONTROL OF METALS

For some years Germany has to a considerable extent controlled the world's trade in metals. By various means enterprising Germans, assisted and encouraged by the German government, had obtained a hold on the industry that placed them in a dominating position. Germany imported mine products far in excess of her own needs and established plants for refining metals and manufacturing products which should have been refined and manufactured in other countries.

Perhaps the most notable example was that of Australia zinc ore, the producers of which shipped their concentrated product to German smelting plants for treatment, under contracts which gave the Germans large profits and at the same time prevented the establishment of rival smelting plants in the British Empire. Writing of this a few years ago, Mr. T. J. Hoover said:

"The present selling contracts to the German zinc smelters represent a handsome profit to the latter. It seems certain that every ton of concentrate, which mostly goes to Germany, represents a clear profit to the Germans of at least 40s per ton of concentrate or 11s per ton of the original material. From the standpoint of the treatment company this seems a rather liberal share of profit to the zinc smelter, and it speaks well for the acumen of the Germans that they tied up this large production under long contracts."

What the Germans have accomplished in the zinc industry they have duplicated in several other branches of the metal industry. It has been notorious that buyers of metals in many countries depended for their supply on Germans who obtained the metals in various parts of the world.

In some cases the metals passed through German hands without ever reaching Germany. Germany, however, made a business of importing a larger supply of metals than she needed and passing on the excess after exacting toll. A considerable part of the Canadian nickel used in Europe passed through Germany in this way, and thus her neighbors had to arrange for new sources of supply as soon as Germany decided to wage war.

As has been recently pointed out by Mr. H. H. Dewart, of Toronto, the largest metal importing firm in England, Henry R. Merton & Co., Ltd., of London, is or was believed to be controlled by the German Metal Trust. The firm was under suspicion and has been doubtless long ago forced to rid itself of its German affiliations.

In commenting on the fact that Henry R. Merton & Co., Ltd., continue to act as London agents for the International Nickel Company, a company which deals almost exclusively in the products of Canadian mines, Mr. Dewart said at a political meeting in Toronto, that the International Nickel Company was employing as its agents men who were hostile to the interests of the Allies and who had been proved to have knowingly traded with the enemy during the progress of the war.

If it were true that the British Government had failed to take precautions to prevent enemy firms from operating in London we would claim with Mr. Dewart that no Canadian nickel should be permitted to pass through the hands of such firms. In view of the fact that Britain has blacklisted enemy firms trading in other countries, it is scarcely conceivable that an enemy firm is being allowed to handle in London such an important article as nickel. Our conclusion from the fact that the Merton company is handling the business is therefore that the control of that company is now completely in British hands. We have some confidence in the common sense of British officials and cannot therefore agree with Mr. Dewart that in dealing with Merton & Co. the International Nickel Company is aiding the enemy. We incline rather to the belief that the company is endeavoring to meet the wishes of the British Admiralty.

## OUR EXPORTS

The war has brought prominently to the attention of the people of the British Empire the importance of guarding our basic industries. It has shown the desirability of utilizing our resources as far as possible within the Empire. It is to be hoped that Canadians will do their part towards developing industries which are necessary to keep in British hands the control of our products. Canada has wonderful mineral resources and is rapidly assuming greater importance as a source of the world's metals. Every encouragement should be given to those who endeavor to utilize Canadian ores in Canada. We should be in a position to ship refined metals instead of ores and matte and we should, whenever possible, ship manufactured products instead of the unworked metal. If European countries want our products they should be encouraged to get them direct from Canada and not through other countries. To make it to their advantage to do so is a problem worthy of the attention of our Department of Trade and Commerce.

We must first, however, have the necessary industries established in Canada. We do not even refine all the metals we need in Canada, nor do we manufacture as large a proportion as we might of the metal goods used here.

In discussing the subject of refining, it is too commonly argued that the amount of a certain metal used in Canada is not large and that we must look to other countries for our market. This is of course true, but

it does not follow that we should not refine every pound of our metal here. If we must look to other countries for our market, why not look for the market for refined instead of that for the raw product?

Suppose that a Russian manufacturer wanted a supply of one of the metals Canada produces. Did any Canadian hear of it? Not likely. And yet the Russian often received metals derived from Canadian ores. He paid far more for it than we received. Refiners, manufacturers and merchants in other countries received the difference.

## AMERICAN SOURCES OF NICKEL.

Recent articles on the question of our nickel exports, published in the daily press contain strange statements concerning the sources of nickel in the United States. Many of these statements are incorrect and it is surprising that so little effort is made to tell the public the truth about nickel. Some of the articles appear rather to be published for the purpose of misleading the people.

A favorite yarn with some of our newspapers is that all the nickel imported or exported by the United States is Canadian nickel. It is of course true that most of the nickel is of Canadian origin, but it is foolish to say that it all is. In the year ending June 30th, 1916, the United States imported from countries other than Canada ore and matte containing about 2,000 tons nickel. This is a small amount compared with that imported from Canada, but at the rate the "Deutschland" is carrying nickel to Germany it would keep that adventurer busy for some time.

It does not follow, of course, that this nickel is available for shipment to Germany. If we have been correctly informed, most of it goes to Russia and Italy. Why some of our newspaper editors continue to deny its existence is, however, a problem.

Some nickel is recovered in United States refineries treating copper containing very small quantities of nickel. The total recovery of nickel from the treatment of foreign and domestic copper in 1914 was 423 tons. Some of this might be obtained by German agents; but it is just as likely that most of it passed into other hands.

## CHROMIUM.

According to reports the "Deutschland" on its second return trip carried a cargo of nickel, chromium, vanadium, rubber and silver. Canada produces large quantities of nickel and silver and a considerable amount of chromite, the chief ore of chromium. It has been stated by our officials that the nickel is not of Canadian origin. No statement has been made concerning the chromium and silver.

Chromium is quite as essential as nickel in the manufacture of most of the steels used for armor plate and armor-piercing projectiles. Chromium is less costly than nickel and nickel-chromium steels can be made somewhat more cheaply than simple nickel steel of the same strength and ductility.

In 1915 Canada exported to the United States 10,087 tons of chromic iron ore. The other chief sources of the chromium used in the United States are New Caledonia, British South Africa and Portuguese Africa. Canada's chief producing deposits are in Quebec in the vicinity of Black Lake.

The United States manufacturers are dependent almost entirely on British and allied countries for their chromium. Greece is the only other country now contributing. Turkey in Asia was formerly an important source.

If the United States is exporting chromium to Germany it is because Britain is allowing more than the United States needs to enter that country. Ships are scarce and could be more advantageously used than in carrying from Africa and New Caledonia to the United States chromium ore which is not needed there.

## IS CANADIAN NICKEL BEING SHIPPED TO GERMANY?

On November 10th, the "Providence Journal," a newspaper which has during the past year proven to be exceptionally well informed concerning the activities of German agents in the United States, publishes the following:

"The German submarine 'Deutschland' is now ready for sea or can be made ready at an hour's notice. Every possible precaution has been taken to prevent the knowledge of contents of her cargo from becoming public property. The Journal, however, has secured all the details concerning this cargo. It consists of nine carloads of nickel, averaging forty tons to a car, and ten carloads of crude rubber, averaging eighteen tons to a car, making a total shipment of five hundred and forty tons. In addition to this material, the 'Deutschland' now has in her hold three carloads of a chemical known as chromium, and one carload of vanadium, both used in the process of hardening steel.

"There still remains in the warehouses of Eastern Forwarding Co., of New London, a consignment of over four hundred tons of crude rubber and two hundred tons of refined nickel, which is apparently stored for export by another submarine.

"All the nickel aboard the Deutschland is part of a large consignment which was purchased in November, 1914, from the International Nickel Co., at Communipaw, N.J. The Journal discovers that this consignment was taken by the purchasers, ostensibly German-Americans, but really men acting for Dr. Heinrich Albert, fiscal agent for the German Government in this country, and transported to the storehouses of the Nassau Smelting and Refining Co., at the foot of West 29th Street, North River, N.Y.

"The nickel was then transferred at various times to the New York Dock Co., in Brooklyn, where it was stored in warehouse No. 104 and placed in casks weighing from nine hundred to fourteen hundred pounds.

"The metal was partially in ingots and largely in a form about the size of buckshot. Just before the ar-

rival of the 'Deutschland' last July, the parties supposed to be controlling this nickel became active and every effort was made to cover up the source of supply by a series of rapid shipments to various points. The last of the shipments took the consignment intended for the 'Deutschland' at Baltimore, to Pittsburg, over the Baltimore & Ohio Railway. The cars containing this nickel remained in the yards at Pittsburg for four days and were then reshipped to Baltimore, being ultimately shipped to the docks of the Eastern Forwarding Co. in that city.

"The next movement of nickel, which remained after the first departure of the 'Deutschland,' came in the beginning of last September, and soon afterwards a number of carload lots were received by the Eastern Forwarding Co., in New London. Two of these cars arrived in New London on September 14th, one on the 15th and four on the 18th. On September 25th, two cars, containing both nickel and rubber, reached New London, and these were followed on September 29th by another car, containing both nickel and rubber. On October 11th another car of nickel was received, and during the next eight days twenty-nine cars of rubber, three cars of chromium and one car of vanadium.

"All this freight was transferred immediately on arrival over a spur track to the warehouses of the Eastern Forwarding Co., on the state pier at New London. It was unloaded by employees of the company and immediately after being placed in its warehouses the nickel was taken from casks to shot bags, in which form it has been placed aboard the 'Deutschland' for its approaching voyage. A large quantity of nickel which reached the New London docks in ingots is still stored in the warehouses there. The metal which was purchased from the International Nickel Co. reached that corporation from Sudbury, Canada, through the Canadian Copper Co."

In view of the repeated assurances by Government officials that our nickel was not getting into enemy hands, we cannot easily accept the statement made by the "Providence Journal." There is, however, cause for uneasiness. Frequently during the past two years it has been claimed that the arrangements made by our officials were not satisfactory; but none of these claims are backed by strong evidence. Those who make such statements fail to disclose the facts, if there are such, which would justify them. It has remained for the "Providence Journal" to offer some real evidence that the safeguards placed around the sale of nickel are not sufficient.

In view of the many false charges which have been made against the nickel producers and Government officials it would be inadvisable to conclude that the statements made by the "Providence Journal" are all correct. The story seems plausible enough, however, and it would be the height of folly to treat it as many of the absurd stories have been treated. Mere denial will not suffice.

If a "large consignment" of Canadian nickel had been purchased from the International Nickel Co. in November, 1914, by German agents, it is scarcely credible that our secret service would not have learned of it in two years. Our officials would know of it and would not be willing to repeat their assurance and thus mislead the public. In spite of the "Providence Journal's" good reputation, we therefore incline to the belief that the nickel shipped on the 'Deutschland' was not Canadian nickel purchased from the International Nickel Company since the war began.

The United States is importing from Canada nickel-copper matte at the rate of over 1,000 tons per week. This amount of matte contains about 600 tons of nickel. In four days there is imported from Canada more than enough matte to furnish the 360 tons of nickel said to have been shipped on the 'Deutschland.' It is natural, therefore, for us to suspect that in spite of the arrangements made this comparatively small amount might have passed into German hands. It is a striking tribute to the perfection of the safeguards that our officials are able to say that such is not the case. We would not have been greatly surprised if they had been forced to admit that a small leak had been found, for the task of preventing such is a great one. When we consider that millions of pounds of Canadian nickel are being used by American manufacturers it is easier to believe that there are leaks than that there are not. If there were leaks our officials would surely not mislead us by saying that there are not.

## CANADIAN MINING INSTITUTE.

A luncheon meeting of the Toronto Branch of the Canadian Mining Institute was held at the Engineer's Club on Saturday, No. 18. Twenty-five members were present.

Dr. W. G. Miller, who is a member of the Ontario Nickel Commission, gave an account of his recent trip to New Caledonia. He related many interesting experiences. In company with Mr. T. F. Sutherland, Dr. Miller visited nickel mines in Tasmania and New Caledonia. At the meeting he described the deposits and presented some idea of the conditions under which the properties are operated. In a later issue of the Journal we will publish some account of the trip.

The talk was illustrated by wall maps and samples of the ore being mined were shown. It was incidentally remarked that New Caledonia has some good chromite mines, one recently developed being exceptionally good.

New Caledonia has been producing nickel ore since 1875. Several of the richest deposits near the sea have been worked out and the operators are now going further inland.

The deposits are much more irregular than those of Ontario and not so large. One mine produced about 600,000 tons of ore, but is now worked out. The industry is well established, has good financial backing and is being profitably carried on.

Following Dr. Miller, Dr. A. P. Coleman and Mr. Geo. T. Holloway spoke briefly on nickel.

# LARGE INCREASE IN ONTARIO'S METAL PRODUCTION

The Bureau of Mines has collected returns from the metalliferous mines and works of Ontario showing the production for the nine months ending 30th September, 1916. Following are the figures for the period, and for purposes of comparison, figures for the corresponding period of last year. It will be noted that there has been a large increase in the aggregate value, and also in the value of nearly all the individual products, due to causes mentioned in the notes appended.

**Summary of Mineral Production First Nine Months of 1916.**

| Product. | Quantity. 1915 | Quantity. 1916 | Value. 1915 | Value. 1916 |
|---|---|---|---|---|
| Cobalt ore, tons.... | 92 | 98 | $ 12,472 | $ 10,591 |
| Cobalt oxide, lbs.... | 135,337 | 378,732 | 107,363 | 231,947 |
| Cobalt metallic, lbs.. | 76,979 | 172,055 | 66,552 | 146,467 |
| Cobalt and nickel oxides (unseparated), lbs. ..... | 2,501 | 57,026 | 500 | 22,890 |
| Copper ore, tons.... | ..... | 1,715 | ..... | 21,685 |
| Copper in matte, tons | 14,057 | 16,989 | 2,024,658 | 6,285,930 |
| Gold, oz. ..... | 281,712 | 363,955 | 5,826,941 | 7,513,734 |
| Iron ore, tons..... | 302,586 | 271,034 | 601,044 | 673,170 |
| Molybdenite (concentrates), lbs.... | ..... | 15,845 | ..... | 15,845 |
| Nickel, oxide, lbs.... | 142,483 | 54,152 | 16,085 | 6,381 |
| Nickel, metallic, lbs. | 11,905 | 17,435 | 4,762 | 7,618 |
| Nickel in matte, tons | 24,054 | 31,046 | 5,369,536 | 15,523,000 |
| Pig iron, tons..... | 354,153 | 501,410 | 4,510,906 | 6,686,965 |
| Silver, oz. ..... | 17,178,629 | 16,203,091 | 8,030,469 | 9,750,040 |

### Gold.

The output from the mines of northern Ontario is steadily increasing, being 28 per cent. in excess of that for the nine months of 1915. Hollinger Consolidated continues to be the chief producer, accounting for 47 per cent. of the total. Dome followed with 21 per cent., and McIntyre-Porcupine with 10 per cent. The other considerable contributors in this camp are Porcupine Crown, Schumacher, Vipond and Jupiter, which together furnished 5.5 per cent. Outside of Porcupine proper. Tough-Oakes yielded $519,149; Canadian Exploration, Croesus and a small output from Dome Lake amounted to over one-quarter of a million dollars. At Teck-Hughes (Kirkland Lake), the mine has been developed, and a mill built which will be put in operation as soon as the power transmission line now being erected from Cobalt has been completed. Other prospects here, the Lake Shore, Wright-Hargrave, Kirkland Lake Gold Mines, La Belle-Kirkland and Sylvanite are also being developed. This is a promising camp. In Gauthier township the Huronian mine is being worked under a lease. Several discoveries of gold were made during the summer in Benoit township, but there has not been time to prove their value. At Tashota, the Tash-Orn company has bought the Wells' claim and has put in machinery to give it a thorough test. This company is also working the King-Dodds claims. A diamond drill has been operated on the Devanney, Reamsbottom and Clive claims.

### Cobalt.

The silver mines of the Cobalt district have definitely established their supremacy of the sources of the world's supply of this mineral. Notwithstanding the war, which has closed the European markets, the shipments of cobalt oxides were much greater, both in quantity and value than in the first nine months of 1915. It will be observed that metallic cobalt is assuming an important place in the list. This is mainly due to its use in the manufacture of special alloys, principally stellite, for high speed tools. Stellite is made of cobalt, chromium and tungsten, and is finding a good demand from munition makers and other workers of modern hard steels.

### Copper.

The extraordinary rise in the price of copper, which averaged 27 cents per pound in New York during the nine months, has brought about the opening of several deposits of copper ore chiefly west of Lake Superior, from which shipments have been made to British Columbia smelters. The principal of these mines is the Tip Top; another at Mine Centre has lately been sending forward to B. C. a carload or ore daily. The price received by the shippers has averaged 18.5 cents per pound for the copper contents. This figure has also been applied to the copper contained in the heavy shipments of matte from the Sudbury nickel-copper mines, and a considerable part of the increase in value of the copper reported is due to the higher valuation, although the quantity shipped was also greater by 20 per cent.

### Molybdenite.

There is a demand in Britain for making tool steel, and several deposits of the ore in eastern Ontario have been opened and are being worked. There are dressing plants at Renfrew and Ottawa, the latter operated by the Dominion Mines Department. Ferro molybdenum is also being made at Orillia and Belleville. The supply of molybdenite throughout the British Empire has been reserved as a war measure, and a price of 105 shillings per unit fixed for concentrates delivered at Liverpool. This approximates $1.00 per pound here.

### Nickel.

The Canadian Copper Company and the Mond Nickel Company have been working their mines and smelters at maximum capacity, and the output of nickel, contained in the matte product of the furnaces for the nine months falls little short of that for the full year 1915. The production for 1916 will probably exceed the production of 1915 by 20 per cent. The valuation of the nickel in the matte has been increased from about 11 cents per pound (the figure adopted by the mining companies) in 1915 to 25 cents per pound in 1916. Nickel refineries are to be erected in Ontario by the International Nickel Company and the British American Nickel Corporation, the latter of which is developing the Murray mine. Small quantities of metallic nickel are being produced from Cobalt ores by the Deloro Smelting and Refining Company.

### Iron.

The whole production of iron ore was from the Helen and Magpie mines of the Algoma Steel Corporation. At the latter the ore (siderite) is roasted previous to shipment. Four blast furnace companies at Port Colborne, Sault Ste. Marie, Deseronto and Hamilton respectively, produced pig iron in quantity 41 per cent., and in value 48 per cent. greater than in the corresponding period of 1915.

### Silver.

The mines at Cobalt continue to produce, though on a slowly diminishing scale. The number of fine ounces contained in the shipments of the nine months was 975,538 below the record for the same period of last year, but owing to the much higher prices that

have prevailed for silver the return to the mining companies was $1,719,571 greater. Silver started the year at 56.76 cents per ounce and rose to a maximum in May of 74.27 cents, when it receded to 63.06 in July, reaching 68.51 cents again in September. In 1915 the monthly average was 49.75 cents per ounce. Nipissing still leads in production; Mining Corporation coming next, followed by Kerr Lake, Coniagas, McKinley-Darragh-Savage, Seneca-Superior, Temiskaming, etc., The flotation process is likely to assist materially in increasing the production of silver at Cobalt. It has been introduced at the Buffalo mine, where it is treating successfully low-grade rock containing 5 or 6 ounces per ton. From the gold ores treated during the period 66,347 ounces of silver were obtained, and from the copper ores 607 ounces.

### THE LUCKY JIM MINE.

**Slocan.**—Concentrate from Lucky Jim zinc ore is now being shipped regularly to the Consolidated Co.'s zinc reduction works at Trail. While several small shipments of zinc ore from other mines in West Kootenay have been sent to Trail for test purposes, this is understood to be the first instance of custom zinc ore being contracted for to be delivered in stipulated quantity. It has been announced that the arrangement made provides for the delivery of 600 tons of Lucky Jim concentrate monthly for a year. Heretofore, since the destruction by fire in the summer of 1915 of the Ivanhoe concentrator at Sandon, all Lucky Jim ore has been concentrated at the Rosebery concentrator, but there has always been a middling product that has not been marketable. Since the resumption of operations at the plant at Kaslo, on Kootenay lake, this middling product has been sent to Kaslo for magnetic separation and the excess iron is now got rid of. It is stated that the basis of settlement is rather more advantageous to the Lucky Jim management under the terms arranged with Trail than if the concentrate were shipped to the United States smelting works.

The Lucky Jim was visited a short time ago by Mr. Sidney Norman, of Spokane, editor of "Northwest Mining Truth," who wrote: "While we have no official figures as yet, we believe we are safe in saying that the net value of 45 per cent zinc ore from the Lucky Jim will be around $17 a ton after allowing for mining, milling, treatment, and overhead charges. This would indicate that the Lucky Jim will henceforth be able to earn approximately $10,000 a month net, upon a production of 1800 tons of mine-run ore. Concentrating ratio is calculated at three into one, but we believe it will probably prove to be nearer two into one in actuality. It is understood that local interests are in a fair way to compose their differences and that tentative arrangements to that end have been entered into. If the present plan be adopted, bonds will be issued for the second mortgage and all other indebtedness on a five or ten-year plan. This will permit of full operation of the property, with overhead charges for interest and sinking fund to retire the bonds at maturity. It is probable that the delayed meeting of stockholders will be held very shortly and a new directorate of heavy local (Spokane) stockholders be elected."

It is said that 70 per cent. of the labor used in connection with the production of nickel is Canadian. Why not the other 30 per cent.?

## MINING AND INDUSTRIAL RESEARCH

By T. L. Walker, Ph.D.

During the past few months much has appeared in the press regarding the urgent need of industrial research. In many instances scientific investigations may lead to the improvement of industrial processes or to the utilization of products which at present are thrown away. Much of the success of German industry was due to the general application of Science to their industrial problems. All will agree that our industries must keep in touch with the scientific progress.

My object in writing at this time is to call attention to the fact that in the mining industry we already occupy a very enviable position in this regard. In Canada most of the mining is conducted by men who are technically trained for their work and who are able to direct scientific investigations or call in the assistance of specialists on concentration, metallurgy, geology, mineralogy and chemistry when special problems arise.

In the sciences closely related to mining and metallurgy, the members of the college teaching staff are usually men who are in touch with the mining industry—as a rule men who have at some time or other been employed in technical work. Contrary to the impression of some advocates of industrial research, these men are working in close co-operation with mining men. While they are frequently called on to assist in the solution of problems, their findings are not available for publication. This fact may account for some of the lack of appreciation as to what they are doing.

The work of the government technical staffs as maintained by the Geological Survey, Mines Branch and the Bureaus of the separate provinces is on the whole satisfactory. The men in these branches are employed in taking stock of the mineral resources of the country and in the solution of special problems as they arise. This satisfactory condition is due to the fact that the mining men—largely technically trained—have been able to direct the work of the governments along the lines most useful.

It is proposed by some that a large central research bureau should be established by the government in order to drive into useful lines the college men who are now supposed to be doing little of **practical** value to the industries. I would suggest that the relationship occupied by the government towards mining might very well be taken as the type of development of research for other industries. If, for example, the tanning, brewing or dyeing industries are to be assisted by the applications of Science, it might be well for the government to employ graduates of special schools in tanning, brewing or dyeing, and to supply each of these specialists with the necessary staff to study the problems of his particular branch with a view to advising operators and solving problems connected with the industry.

The mining industry in Canada is not suffering because of lack of co-operation between the men who are operating mines and smelters and the college and government specialists. I am not aware that mining men feel that there is need of any radical departure. To be sure there is much to be accomplished but the method of procedure has already been settled.

### THE "TANK."

St. George to-day his dragon tames
And sends to do his will;
From mouth, tail, sides, its hot breath flames
In jets that sear and kill.

Across the weird, misshapen lands,
Through misty dawn it crawls;
No clump or pit or cleft withstands,
No bog or mesh now stalls.

Loose-jointed and ungainly reels
Its bulk o'er crater, stump,—
All's smooth for caterpillar wheels
And alligator hump.

Like prehistoric monster dread
It undulates and grunts;
Shall it be comic, tragic, said?—
Depends on how it fronts!

With clownish grin the Tommies trail
The lurking path it's made,
And cheer to watch it squat and flail
Each trench in enfilade.

But Teuton caveman views with pain
O'erhead, at front, on flank,
The pterodactyl aeroplane,
This ichthyosaurian tank!

Like dragon-scales its armor plate,
Of prehistoric view;
And yet, it's doubly up-to-date,
And most symbolic, too,—

The farm-tool, that a pervert soil
Of stone and stump makes yield,
Adapted still to clearing toil,
Grubs now in war's red field!

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### HOLLINGER COSTS.

In his report for 1915 Mr. N. A. Timmins, president of the Hollinger, says:

"The principal work of the year consisted in mining and milling 334,750 tons of ore having a gross value of $3,384,666.84, and an average value of $10.11 per ton. Exclusive of taxes and depreciation, an actual working profit of $6.16 per ton was made. We believe that this record will compare favorably with work of a similar nature being done in any other mining camp. Development work has not been neglected, as is evinced by the fact that two miles was added to our already extensive underground workings, and an addition of 35,000 tons was made to our reserve of broken ore. A gratifying reduction has been achieved in the costs of operations. In last year's report the hope was expressed that a cost of $4.00 per ton could be reached before the end of the year. Results for the year show that in spite of material advances in the costs of supplies, a total working cost (exclusive of depreciation) of $3.54 per ton was attained. We confidently expect to effect stil lfurther reductions during the present year."

## THE COST OF COAL*

By Geo. Otis Smith and C. E. Lesher.

The price of coal is a matter of vital concern to the average citizen. No less important, however, is the question what our coal actually costs to produce and the interest in this subject is typical of the popular interest in the large productive enterprises of the country. As citizens we recognize the consumer's dependence upon the producer and are taking advanced ground as to their relative rights. In few industries does this dependence seem more vital or the consumer's equity appear larger than in that of producing and selling coal. The per capita annual expenditure for the useful metals is roughly equivalent to that for coal, but few citizens purchase pig iron or bar copper, whereas of the urban population only the dwellers in apartments, boarding houses, and hotels are spared the necessity of buying coal. The consumption of coal in the United States for heating and cooking is between 1 and 1½ tons per capita. A careful estimate for 1915 is 1.1 tons, which happens to be identical with the figure determined for similar consumption in Great Britain in 1898. This nonindustrial consumption is greatest in cities, and in Chicago in 1912 it was nearly 2 tons. Of course every citizen indirectly pays for his share of the total consumption which last year amounted to 4.6 tons per capita.

Again it may be that because to a larger degree the cost of metals is charged to capital outlay rather than to the operating expense of life, we appreciate less keenly the unit price of these materials that are not immediately consumed with the using. At any rate, public opinion is more easily brought to a high temperature by considering the price of coal than by considering the price of any other product unless we except gasoline, recent discussion of which has been almost explosive.

Looking backward as well as forward, one need not be an alarmist to suggest that in the whole field of productive business the coal industry seems the one most likely to be threatened with Government operation. The foodstuffs are produced on land owned and operated by the millions, and so far as the production of the raw material for them is concerned, "monopoly" is an unknown word, but when we think of coal, terms like "barons" and "trusts" instinctively come to mind. For these reasons the determination of certain facts connected with coal production and the analysis of the cost elements that enter into the price of coal constitute a timely subject for discussion.

In discussing costs, however, we do not overlook the too evident fact that at times price may far outstrip cost. The price of coal depends upon the balance between necessity for fuel on the one hand and ability to produce and to deliver on the other; the ability to produce is in turn controlled by the labor available and the ability to deliver is dependent upon car supply. Increased foreign demand for American coal, large industrial consumption, unusual weather—all may have great influence on the current price of coal, but none of these is to be considered a factor in the actual cost of production except so far as it causes irregularity in operating expenses and promotes a decrease in efficiency of mine labor. To-day high prices are being received for coal by those who are able to produce and deliver more than their outstanding contracts require. In others words, a few traders may be able and willing to capitalize the urgent necessity of the consumer and

* Extracts from a paper read at the American Mining Congress, Chicago, Tuesday, November 14th, 1916.

their own ability to deliver. The premium for fuel now being paid generally by the consumers, and by such traders as have been caught short in their contracts is in reality not properly chargeable to cost of coal, but to cost of car and labor shortage, just as in the times of stress accompanying labor troubles the premium paid by their consumers is a part of the price the country pays for strikes.

Four general items of cost must be considered as normally controlling the price of coal to the consumer —resource cost, mining cost, transportation cost, and marketing cost. Under usual conditions each of these items includes a margin of profit which may seem either excessive or inadequate, according to your point of view. Yet an unbiased consideration of these cost items is absolutely essential as a preliminary to the decision by the public whether we are buying coal at a fair price, and if not why not. As long as it is the popular view that the price of coal is made up of one part each of mining costs and freight costs to two parts each of operator's profits and railroad dividends, with the cost of a certain amount of needless waste on the side, the demand for investigation will continue, and in so far as there is any element of truth in this view, legislative action is justified, even though the prescribed reform may approach the extreme of public ownership and operation of mines and railroads.

As the initial item of cost, the amount charged against the marketed product as the value of the coal in the ground, which for brevity may be termed the resource cost, is perhaps the item most often overlooked by the coal consumer. The item of marketing cost is one that can be brought directly under observation by the consumer if he will but study the matter intelligently; the transportation cost can be learned by simple inquiry; and the details of mining cost can best be set forth by the mine operators themselves, for they have now adopted the policy of free discussion of these matters, which they once regarded as sacred from public view.

The item of cost first to be considered represents that part of the value given to the ton of coal by the mine operator and the mine worker. This may be termed mining cost, but it must include the operator's selling costs and other overhead expenses as well as the mining costs proper which include the larger expenditures for wages, supplies, and power. This cost plus the resource cost—the royalty or depletion charge —and the profit or loss on the sale make up the value at the mine mouth. The mining cost varies not only between mines of different companies in separated fields but even between adjacent mines of the same company in the same field. Both nature and man contribute to such variation.

It is not practicable to assign a very exact figure to the mining cost—the census of 1909 indicated an average of $1 a ton for bituminous coal and $1.86 for anthracite, but these figures are believed by some operators to be too low. It is possible, however, to show in a general way the distribution of this item; the cost of mining is divided between labor, 70 to 75 per cent.; materials, 16 to 20 per cent.; general expense at mine and office and insurance, 2 to 4 per cent.; taxes, less than 1 per cent. to 3 per cent. for bituminous coal, and 3 to 7 per cent. for anthracite; selling expenses, nothing to 5 per cent., and recently to these items has been added the direct and indirect cost of workman's compensation, which may reach 5 per cent. for bituminous coal. The charges for labor, material, and general office expenses are easily understood, as is also a charge for depreciation of plant and machinery; but taxes and selling expenses are important items that may be overlooked by the casual observer. Some figures recently published show that the taxes levied in West Virginia last year on coal lands and coal-mine improvements—that is, on the industry as a whole—were equivalent to nearly 3 cents per net ton of coal produced, which is doubtless fully as much as the profit made by many of the operators in that State.

The cost of selling coal is nothing for the companies that use their own product, including the Steel Corporation and a large number of others, and is little or nothing for the producers who sell nearly all their coal to such large consumers as the railroads. Companies that produce coal for domestic use and the general run of steam trade, must figure on a selling cost as high as 10 cents or more per ton, the cost depending on the extent of their business. The average selling cost for bituminous coal is probably 5 to 10 cents a ton, and for anthracite the usual charge of sales agencies is reported as 10 cents a ton for steam sizes and 15 cents for the prepared sizes.

The producers of coal and the transportation companies are concerned not so much with the actual rates charged for carrying coal as with the adjustment of rates between different coal fields and between different markets. The consumer of coal, however, is interested in the actual rather than the relative freight rate.

The transportation rate in force from any coal field to any market can readily be learned by the consumer who wishes to figure this item in the cost of the coal he buys. Therefore in the present general consideration of the subject it is sufficient to state the average value of this item. In the interstate traffic, both rail and water, bituminous coal probably pays an average freight of nearly $2 per ton. In other words, the transportation costs more than the product and, as some parts of the country are just now learning, is sometimes more difficult to obtain. The value of coal like the value of so many other commodities, is a place value.

The average freight charge on anthracite is higher than that on bituminous coal, first because the rates are higher and second because, all movement considered, the coal is carried a greater distance.

The cost of handling the coal, exclusive of freight, from the time it leaves the producer until it is in the consumer's fuel bin, may be termed the marketing cost. It can readily be seen that a large part of the coal produced is not subject to this cost for most large users of steam coal, such as the railroads and the coke manufacturers, place contracts directly with the producing companies or their selling agencies, and buy in the open market only when their needs exceed the deliveries under their contracts. Much of the coal, however, both anthracite and bituminous, passes through the hands of a wholesale dealer or jobber before it is received by the retail dealer who puts it in our cellars, or in the bins of a power plant. Coal that gets a long way from the mine may pass through many hands before it reaches the consumer, and it not only pays commissions all along the line, but is subject to shrinkage and deterioration, both of which enter into the final selling price to the consumer. Brokers are usually satisfied to make a gross profit of perhaps 10 cents a ton, but as several brokers may

make a "turn over" on the same car before it is unloaded, this element of cost may be several times that amount.

About half of the anthracite and around 15 per cent. of the bituminous coal is retailed in less than carload lots, and the greatest number of individuals are directly concerned in the marketing of this portion, regarding the profits on which there is the widest divergence of opinion. The margin in the retail business between cost on cars and price delivered is between $1.25 and $2 a ton, and is not more than enough to give on the average a fair profit. The shrinkage and, in part, the deterioration are together seldom less than 1 per cent. of the weight and may exceed 4 per cent., and the retail dealer also must provide in his selling price for uncollectable accounts.

The largest single item in the cost of retailing is of course that representing the labor of handling and the local cartage, which together make up about half the marketing cost.

There now remains to be considered the first major item, or the resource cost, which is what the operator has to pay for the coal in the ground—the idle resource, which he starts on its career of usefulness. This cost is expressed as a royalty or a depletion charge.

One of the latest leases by a large coal-land owner provides for the payment of 27 per cent. of the selling price of the coal at the breaker. This percentage is therefore not only a royalty figured on the mineral resource but also a commission based on the miner's wage. To bring this right home to you and to me, it may be said that the practical result is that if the anthracite we burn in our range this winter happens to come from that particular property, we will pay fully $1 a ton into the treasury of the city trust that owes its existence to the far-seeing business sense of a hard-headed citizen of Philadelphia. Whether such a royalty is excessive or not, the fact remains that this is the tribute paid to private ownership.

The present average rate of royalty on anthracite is probably between 32 and 35 cents a ton on all sizes, which is from 12 to 14 per cent. of the selling value at the mine

The bituminous coal industry is a modern institution compared with the mining of anthracite, and much of the bituminous coal land was acquired by the operating companies during the last 20 years for little if anything more than its surface value. To-day there are large areas of bituminous coal-bearing lands that, because they are undeveloped and without railroads, can be purchased at a low price, but little or no anthracite land is on the market, and little has changed hands for years. The present average resource cost of bituminous coal is not much over 5 cents a ton, or about 4 per cent. of the average selling value at the mine. In the Pocahontas region and the Pittsburgh district the royalties are much higher, but these like others that might be cited, are exceptions—one due to coal of special quality, and the other to location—factors which, incidentally, are exactly those that have assisted in making the resource cost of anthracite what it is.

Should you be interested in summing up all these various costs and striking a balance between labor's share and capital's return, you would find that the mine worker, the trainman, and the wagon driver together receive fully half of the price of the anthracite delivered at your house, and the same three classes of labor receive not less than half the price paid by the average consumer for the cheaper soft coal. In a similar manner the average return on the capital invested in land, mining plant, railroads, and coal yard may be roughly calculated, with the result that landlord, bondholder and stockholder of coal company and railroad together receive about $1.15 from the ton of anthracite, and only 50 to 75 cents from the ton of bituminous coal, and of either of these amounts the mine operator's share is only a small fraction.

## STANDARD SILVER-LEAD MINING CO.

The following information concerning the Standard Silver-Lead Mining Co., which is operating silver-lead-zinc mines and a concentrating mill near Silverton, Slocan Lake, British Columbia, was published recently in Spokane, Washington, in which city the company has its head office:

The relative operating profit of the Standard Silver-Lead Mining Company for September was $38,287, according to a report that accompanied checks for the monthly dividend of $50,000 issued yesterday. The profit for July was $56,608, June $30,398, and March $136,943.

In addition to the receipts the company has 600 tons of zinc concentrates made during September, the value of which does not enter into the figures representative of profits. These concentrates have been netting the company $30 a ton. The shipment of all zinc accumulations is expected during this month, it is stated by Charles Hussey, the secretary.

The financial statement of the Standard for September is summarized as follows:

**Receipts.**

| | |
|---|---|
| Preliminary settlements for 275 tons | $33,056 63 |
| Zinc sales | 17,137 08 |
| Financial settlements for July | 4,073 17 |
| Boarding house | 4,781 55 |
| Store supplies | 2,101 19 |
| Total | $61,149 62 |
| Less zinc penalty for May | 673 42 |
| Balance | $60,476 20 |

**Disbursements.**

| | |
|---|---|
| Ore production, including mining, shipping, marketing, power, salaries, expenses and taxes | $36,287 98 |
| Relative operating profit | 24,188 22 |
| Development | 4,709 85 |
| Construction | 19 00 |
| Aylard tunnel | 1,683 30 |

The balance on hand September 30 was $254,319.01.

## GOLDENVILLE MINING CO.

The Goldenville Mining Company property at Goldenville, Nova Scotia, and the J. B. Niely property at the same place have recently been consolidated under the name of the Goldenville Consolidated Mining Company. No operations have been carried on underground since early in August.

## LOON BROOK MINING CO.

The Loon Brook Mining Company at Montague have recently run into bonanza ore on east drift of 180 foot level. Gold to the value of between $25,000 and $30,000 in specimens was taken out in two days. This is the richest of several strikes that have been made at this mine within the past two years, and is the richest find made in the province in recent years.

# THE WEATHERING OF COAL*

By J. B. Porter.

Weathering in nature takes place at and near the outcrop of coal seams, and in some cases this action has even resulted in spontaneous combustion and considerable quantities of coal have been completely or partially destroyed in place in the beds. Ordinarily, however, the natural weathering of seams is too slow to cause fire, and all that happens is the disintegration of the coal, accompanied by the loss of part of its combustible matter, and a more than equivalent increase in ash. Outcrop coals are thus almost always of poor quality, but fortunately the damage rarely penetrates far into the seam, and coal as ordinarily mined shows little or no sign of oxidation in the destructive sense in which the term is used in this discussion.

The artificial or commercial weathering of coal begins the moment the miner's pick exposes its surface to the air of the mine, and this weathering continues with increasing, or decreasing intensity, depending on circumstances as long as the coal is exposed to the air. Weathering may thus be considered as taking place (a) in or near outcrops or fissures in nature; (b) in the coal mines; (c) on the surface during preparation and in transit; (d) in storage while awaiting use.

The first case is of little interest or importance except to the geologist and will not be discussed in this report, but the other cases are all deserving of separate consideration, although the general phenomena of weathering are alike in all.

**Weathering Action Taking Place in the Mine.**

Changes undoubtedly commence to take place in coal immediately upon mining, owing to the alteration of conditions. Coal in situ is under pressure due to the superincumbent strata, and it is also absolutely removed from contact with the atmosphere, but as the mining operations approach the coal gases, which it ordinarily contains under pressure, begin to escape. This evolution of gas becomes more rapid when the coal is actually broken down, and for a time probably almost protects it from oxidation, but both oxidation and desiccation no doubt commence almost immediately and increase as the escaping gases decrease, and cease to protect the coal from the action of the air.

Evolution of Gas.—Par and Wheeler have shown that a combustible gas is given off by coal immediately upon mining; they sealed coal up in air-tight jars, and found that after ten months the vessels were filled with a combustible gas under pressure.

Taffanel states that it is during the first ten days after mining that the greater part of the available methane is set free; he obtained a liberation of 14—22 c.c. per grm. of coal. These figures do not include the methane evolved during the period elapsing immediately after breakage at the face.

Porter and Ovitz believe that methane is formed by slow decomposition of the coal, and they quote the work of Chamberlin, in which he crushed coal under a high vacuum, obtaining only a quantity of gas equal to one fourth the volume obtained by bottling for six months. During two weeks after mining they found that a certain coal lost three-fourths of its own volume of gas, and after five months it has lost an amount equal to one and three-fourth times its own volume. They seem to think that this is a great deal, and in a chemical sense it may be, but from the practical standpoint it is of little importance except in the case of coal carriage in ships. If we consider the huge volume of air which sweeps constantly through a mine and the amount of gas given off by the coal during development work and before it is mined, this gas from the mined coal is unimportant: although, of course, immediately bad ventilation comes in, we have an entirely different situation. The loss in calorific value due to the escape of this 1¾ volumes of methane if calculated out, is seen to be negligible as compared with other weathering losses.

Taffanel draws attention in his paper to the evolution of methane from coal in the mine, he, however, attacks the subject chiefly from the point of dust explosions; he gives figures for the quantities of gas given off by the samples upon which he experimented.

In this, as in every other action which we are to study in connection with this subject, every coal has its own individuality, due in part to the particular condition of pressure, water, associated strata, etc., in the mine; and in part to the exceedingly complicated organic compounds, resins, albuminoids, etc., of which it is composed.

Absorption of Oxygen and Oxidation.—This subject will be taken up at length in subsequent pages, but we may perhaps here quote certain observers who have particularly studied underground conditions. Porter and Ovitz following various earlier writers, state that "the air in a poorly ventilated section or closed portion of a mine is deficient in oxygen, and contains much less carbon dioxide than it would if all the oxygen that must have been removed from the air by the coal were immediately split off in combination with carbon." This absorption of oxygen is due in part to the coal left in the walls and pillars, but in most cases the chief absorption is by the broken coal and carbonaceous shale, and particularly by the coal and shale dust which is always produced in mining.

Parr and Wheeler state that pillar coal in a particular district after 25 years loses only 2.5 per cent. of its calorific value; this illustrates the imperviousness of unbroken coal to the air. The main deterioration in pillar coal is found, however, to be due to its increased friability resulting chiefly from the heavy pressure to which it has been subjected.

Interesting figures are given by Haldane and Meachem, to show that 80 per cent. of the heating which air undergoes while passing through a mine, can be accounted for only by the weathering of the pyrite and the coal itself. Their experiments which are described below were carried out at the Hamstead colliery, South Staffordshire, where the "Thick Seam" is worked at a depth of about 2,000 feet below the surface, and their observations and conclusions are so interesting that no apology need be offered for summarizing them at some length.

They noticed that the general effect of opening up the mine was to warm both the coal and the strata adjacent to the workings. The average temperature on the surface at Hamstead is 49 degrees F. At the bottom of the intake shaft the temperature is much more constant than at the surface and averages 60 degrees F. The air is compressed as it descends the shaft and this compression would account for a gain in temperature of 10 degrees. A little moisture is taken up by the air in the shaft, and this must tend to cool the walls so that some heat is transmitted to the air from the strata.

From the pit bottoms the air steadily increases in temperature at the rate of about 6 degrees for every

3,000 feet. In the workings the temperature is generally about 80 degrees to 85 degrees. In the return airway there is a relatively slow though steady fall of temperature from the face to the upeast shaft. The average temperature in the main north return airway is 77 degrees. Analysis of the air shows that this fall in temperature is probably due to the leakage of air from the intake to the return airway.

To determine the temperature of the undisturbed coal a maximum and minimum thermometer was inserted into the end of a 10-foot borehole in freshly cut coal. The hole was then closed with clay and left undisturbed for at least several days. Several such experiments showed the temperature of the coal to be 66 degrees. Similar experiments were made in coal which had been long exposed. They showed that coal behind such an exposed surface gradually rises in temperature. Thus at two places in the side of a main road the temperatures at the ends of 10-foot boreholes were taken in 1894 and 1898. In 1894 the temperatures were 66 degrees and in 1898 they were 93 degrees and 90 degrees.

It was impossible to correctly calculate the total heat generated in the mine since there must have been large radiation losses through the walls, roof and floor. The amount of heat, which escaped by the return airway could, however, be calculated. Such a calculation shows that the total heat carried away per minute by the air-current was 48,000 B. Th. U., each cubic foot of air passed through the mine, therefore, carried off with it approximately one B. Th. U. of heat.

Summarizing Haldane and Meachem's paper further there are several possible sources of heat in a mine. Of these the most obvious are the presence of men and horses and lights. The heat from these sources is, however, approximately determinable and in the case of the particular mine under very careful calculations showed that it could not have exceeded 7 per cent. of the heat leaving the mine. Another possible source of heat is the friction due to the settling down of the roof and consequent grinding of the coal and other material by the pressure of the superincumbent strata. The depth of the Hamstead workings is 2,000 feet. Assuming the specific gravity of the strata to be 2, the authors arrived at a pressure of 250,000 lbs. per square foot or about 0.8 tons per square inch. The average output of coal from the north side of the pit was about 15 cubic feet per minute and the average rate of settling down of the strata could not exceed this. The heat liberated could therefore not exceed the heat equivalent of 15 x 250,000 ft. lbs. of work, i.e., 4,850 B. Th. U. Even if this were all given up to the mine air it would only be about 10 per cent. of the total heat leaving the mine. The friction of the air current passing through the mine also produces heat,—the amount which could have thus been generated could, however, never exceed 1.7 per cent. of the total heat withdrawn from the mine.

It is clear then, that the main portion of the heat generated in the mine was due to some cause other than any of those mentioned, and the obvious conclusion is that it is due to the chemical action of the air on the coal. Haldane and Meachem made a large number of experiments on the subject and compiled analyses of samples of air taken in the mine.

These analyses show that as the air passes through the mine it steadily loses oxygen and gains carbon dioxide. On the average, however, the oxygen loss is 3.13 times the gain in carbon dioxide. It is very noticeable that the temperature increases with the diminution of oxygen from the air, and Haldane and Meachem's calculations show this increase to be greater than could be accounted for by friction.

Two more series of tests similar to the above were made at different times. The results checked those of the first test very closely except that the percentage of carbon dioxide in the samples taken on January 5 showed a marked increase over that found in previous samples. Haldane and Meachem attribute this to the fact that the barometer was falling on that day, and that this fall caused a flow of gas from old workings.

The absorption of oxygen by anthracite and by bituminous coals in the mine, is clearly demonstrated in a paper by G. N. Burrell, for the gases in an enclosed portion of an anthracite mine. This section of the mine was sealed off because of a fire which existed in an adjoining section. The fire did not, in his opinion, affect the particular area from which the samples were obtained, because of a heavy intervening roof fall, consequently the gases represent those trapped and given off normally in a stagnant section, except that one stopping was leaking and some air was entering from the ventilating current. The stopping was tightened and rapid absorption of the available oxygen by the coal ensued. Four days later the oxygen had dropped to 3 per cent., even though some air was still finding access to the enclosed area.

This matter of underground weathering is ordinarily of but little importance, so far as the commercial value of the coal is concerned. It is however of immense importance in mining, as a certain amount of broken coal and coal dust is unavoidably left in the workings and abandoned there, and this material and the carbonaceous and pyritic shales often found just over the coal frequently give great trouble by heating and starting underground fires. In some seams spontaneous gob fires are of so common occurrence that special methods of mining have to be employed, and in still other cases the only safe way of operating is to laboriously remove all fine coal and all fallen shale.

### Weathering Losses in Transit.

Parr and Wheeler sampled some coal at the mine and again a week or so later after transit in cars, and they found deterioration in the order of 100 B. Th. U. for the coals taken, whose value when mined was about 14,600 B. Th. U. It is probable that part of the above loss of calorific power was due to the escape of hydro-carbon gases, but the observers are no doubt right in ignoring this as a factor of importance.

The chief loss, in transit, however, must be due to breakage caused by handling, and, although with the modern equipment now in use by large companies, breakage is greatly reduced, these breakage losses are quite considerable.

In the majority of cases of shipment by rail, the coal does not remain long enough in the cars to suffer any great change, except that of breakage just referred to, but when shipment is made by vessel, and the distances are great, the case is different. As has already been stated in the introduction, the subject of weathering was first brought before the public in connection with the all too numerous cases of fires in sailing ships carrying cargoes of coal from England to distant ports. Such ships frequently spend months on a single voyage and much of that time is often in the tropics, and unless the coal is an anthracite, or very exceptional precautions are taken, spontaneous fires are almost certain to occur. It is not necessary, however, to deal at length in the present work with this very special subject of coal cargoes, as the causes of heating will be sufficiently considered in the general

discussion of weathering, oxidation and storage, while the technical problems of loading and discharging colliers, and of preventing and fighting fires on shipboard, have already been reported on at length by the several Royal Commissions appointed for the purpose.

### Weathering Losses in Storage.

From the work of many experimenters we know that if fresh coal of almost any character be stored in a pile, the temperature of the mass will at first rise. Many kinds of coal never go further than this, in ordinary storage, but gradually cool off again and remain without further marked change for any length of time.

A great variety of coals on the other hand continue to heat, and if nothing be done to ventilate them or otherwise artificially cool them, they ultimately catch fire, and the main purpose of the report prepared for the Mines Branch is to discuss the causes of this destructive action and the various methods which have been proposed for its prevention or cure.

In our study of the subject of weathering is was unnecessary to attempt to distinguish any further between action taking place in the mine, in transit, or in storage. In fact it would be impossible to do so satisfactorily as in some cases the character of the coal seam and the method of mining make it possible to get out the coal very promptly, and to place it in the consumers' storage pile while it is still giving off hydro-carbon gases, and has scarcely had time to begin to oxidize. In other cases much of the coal remains in underground pillars for a very long time and even the mined coal is handled slowly and suffers considerable change before it reaches the consumer. It is, therefore, best from the practical point of view to consider the question of weathering as a whole.

### Causes.

It is generally believed that anthracite is not liable to spontaneous combustion and this belief is correct in that anthracite will not ignite spontaneously under ordinary conditions. Fayol's experiment, which has been fully confirmed in a general way by numerous observers, proves conclusively that liability to weathering is least in anthracites and greatest in lignites with bituminous coals in an intermediate position, and in a practical sense we may take it that hard anthracite is not appreciably affected by exposure. On the other hand the true lignites suffer so greatly not merely by spontaneous heating, but by dehydration and disintegration, that their storage on a large scale is unlikely to become an important problem for some time in Canada at least. The real practical problem is, therefore, to be found in a study of bituminous and semi-bituminous coals, and the remainder of this paper will deal almost exclusively with coals of this character.

### The Effect of Moisture.

In all probability the temperatures of ordinary coals under ordinary conditions of storage are not raised to any appreciable extent by moisture. The question naturally arises, what was the basis of the once prevalent belief that moisture was an important factor in spontaneous heating?

This belief is, no doubt, chiefly due to the confusion of cause and effect on the part of persons who have discovered fires in coal storage. It is commonly observed that fires or hot spots in the pile are discovered shortly after rain storms, and that nearly always a hot spot is surrounded by damp or wet coal even if the main part of the pile is dry. The first case is easily explained by the fact that dry coal is so poor a conductor that the surface of a pile may show no indication of a hot spot or even an incipient fire in the interior. A rain storm would however provide moisture enough to soak into the pile, and this moisture on approaching the hot spot would be turned into steam which would work its way back to the surface and be observed, thus attracting attention to the hitherto unsuspected heating. The second explanation is equally simple. Air dry coal always contains some moisture, and in lignitic coal there is also a very considerable amount of combined water. In the case of a hot spot in the interior of a pile this moisture is driven off, either by escaping at the surface as steam, or condensing on the cooler coal in the neighbourhood. Added to this there is of course an actual formation of water when the hydrogen constituents of coal are oxidized.

### Disintegration Due to Weathering of Pyrite.

That pyrite causes disintegration of coal on weathering is well known, and the fine coal thus produced, undoubtedly increases the tendency of the mass to heat, but it is difficult to get any very definite measure of the effect, as other causes also result in disintegration. The action in brief is that pyrite in the presence of moisture and oxygen is more or less completely converted into oxide and sulphate of iron with the simultaneous production of appreciable quantities of sulphuric acid. This acid in time attacks the carbonates of lime and magnesia which are usually present in the cleavage and joint planes of the coal, converting them into sulphates. These chemical reactions all involve increase in bulk followed often by shrinkage due to the solution of the soluble sulphates produced. Thus the coal on the whole suffers a much greater degree of disintegration than might at first be expected from the small amount of pyrite oxidized, which in ordinary cases does not exceed from 10 to 25 per cent. of the total pyritic matter in the coal, i.e., a small fraction of 1 per cent. of the total.

From a review of the various and apparently contrary opinions held by the numerous experimenters who have studied the oxidation of pyrite in coal, it seems reasonable to conclude that the divergence of opinion is very largely due to differences in the coals studied, and that in an average bituminous coal the actual heat generated by oxidation of the pyrite is, in itself, not usually very important. Taken, however, in connection with the fact that any small increase in temperature of the coal will greatly increase the rate of absorption of oxygen and consequent heat production, the heat produced by the weathering of pyrite may become a very important factor. Whether it will do so or not will depend on whether the coal under consideration can generate heat sufficiently fast by its absorption of, or chemical combination with oxygen, to raise its temperature to the danger point without assistance from the heat due to the oxidation of the pyrite. The effect of pyrite in liberating free sulphur and thus lowering the ignition point is unimportant since the point at which autogenous oxidation begins will have been passed before the ignition point of sulphur is reached.

The calorific value of a carbon hydrogen compound is so much greater than that of pyrites that a much smaller quantity of the former would yield any given amount of heat, and this fact taken in conjunction with the relative simplicity and accuracy of the chemical determination of sulphur makes it probable that heating has in many cases been ascribed to the alteration of the pyrite, when in reality it has been due to an oxidation of organic matter that has not been detected by the chemist.

There are, however, some coals in which the pyrite or marcasite is excessive in quantity or, like the "Barnsley softs" or the Williamson county, Illinois, "New Ohio," in which it is peculiarly susceptible to oxidation, and in such coals, it is probable that pyrite oxidation is an important, and perhaps the primary cause of heating. Such coals are, however, comparatively rare and, owing to their softness and excessive sulphur they are of lower commercial value than normal coals.

**Size of Coal.**

Whether it be the pyrites in the coal which first oxidizes or the coaly matter itself, it is clear that the action is largely superficial, or in other words, the rate of weathering in any coal is approximately proportional to the surface exposed to oxidation. This surface is of course inversely proportional to the diameter of the particles, or in other words a ton of coal in one-inch lumps has only half the surface of a ton of half-inch lump, or one one-hundredth the surface of 1-100-inch lump, which may be taken roughly as the average size of coal dust, although really fine dust is of course much finer than this, and therefore has very much more surface.

Other things being equal, therefore, we may say that the rate of weathering increases directly with the reduction in size and is immensely more rapid with fine coal than coarse, but this is only true within limits, for in order that weathering may take place it is of course necessary for air to come into contact with the surface, and excessively finely divided coal packs so close that it is virtually impermeable to air and thus after the included air gives up its oxygen no more can gain access.

The aim of every colliery is always to produce as large a proportion of lump coal as possible, not primarily because of anticipated difficulties due to weathering, but because lump coal burns better in ordinary use and, therefore, commands a better price; but the operations of mining unavoidably produce a considerable percentage of fines even from the hardest coals, and many otherwise very good coals are so friable that "slack" constitutes the chief product of the colliery.

The experience of the Calumet and Hecla Mining Company may well be quoted here; they at one time stored all their coal in the form of "run-of-mine," and experienced much trouble from heating; upon changing their methods so that only oversize from a bar-screen was stored, and the undersize used as soon as possible, all trouble with heating of piles ceased.

**The Size, Shape, Etc., of the Storage Pile.**

When coal is kept in a storage pile for a considerable length of time it is a comparatively simple matter to study its condition by keeping a record of temperatures in a sufficient number of places in the pile. We can thus readily follow the variation in temperature of the mass, as all the reactions are exothermic.

Any heating of the interior of the pile, whether it be small or great, must be primarily due to oxidation, and the source of oxygen is the air which filled the voids in the broken coal during the piling, and other air which thereafter works its way into and through the interstices during the whole existence of the pile. Some of the heat evolved is lost by radiation and convection, but a considerable part of the loss is due to the cooling effect of the interstitial circulation above referred to. It is thus clear that the physical condition of a storage pile, that is to say its bulk, porosity, etc., has a very important influence on its rate of heating. A thin or porous pile may oxidize rapidly, but it will be kept cool by radiation and excessive ventilation. A very high and compact pile will get too little air to support any serious oxidation in the interior and its deeper parts will, therefore, heat very little. A pile of intermediate porosity or a particular zone in a large pile will get enough air to cause heating and not enough to carry the heat away and will thus give a maximum of trouble.

This matter of porosity is of greater importance than might at first be imagined as the interstitial spaces in a pile of broken mineral range from 15 per cent. to nearly 50 per cent. of the total bulk, but in addition to this the initial temperature of piling also has a considerable effect. Oxidation proceeds, other things being equal, more rapidly as the temperature rises, and the rate of ventilation also increases both for evil and good as the coal gets hotter and the difference between the internal and the atmospheric temperature rises.

**Initial Temperature of Storage.**

The term "autogenous oxidation" has been so widely used that it is retained in the present volume, but the word autogenous is not always correctly employed, and here as elsewhere it is liable to give rise to misapprehension. There is undoubtedly for each particular case some particular temperature below which oxidation will generate heat no more rapidly than radiation and convection can dissipate it; and coal stored below this temperature will not rise above this critical point, and will, therefore, be safe; whereas the same coal stored at a higher temperature, or heated by any means to such temperature, will have its rate of oxidation accelerated, and will thus generate heat more rapidly than it dissipates it, and, therefore, grow hotter and hotter until it ignites. This critical temperature is, however, dependent not merely on the particular coal used, but on the size and shape of the pile, the size of the fragments of coal itself, the degree of moisture, and to a certain extent on the external temperature, the character of ground under the coal pile, etc., etc. The changes in the critical temperature due to variations in these numerous factors are so great that any statement of the temperature of autogenous oxidation of a coal is useless and often mischievous unless accompanied by a statement of the determining conditions. It is, however, quite possible for persons experienced in the storage of particular coals to arrive experimentally at the approximate critical temperature below which their coal in their standard storage pile may be permitted to heat without anxiety to those in charge; while if the heat in any spot rises above this temperature the coal requires prompt ventilation, careful watching, and possibly digging out.

From what has been said above it is obvious that the initial temperature of storage is of very great practical importance. Attention was directed to the matter in 1898 by the New South Wales Commission which recommended strongly that when coal was put into storage in any shape or form, the handling should be carried out as much as possible during the coolest part of the day. The commission was considering the case of loading ships in a subtropical climate, and its advice appears very necessary in that if the coal is being loaded while the sun is shining it becomes greatly heated and these hot layers get covered over and so retain their heat as the superincumbent coal is a poor conductor. As a matter of fact the Commission's advice is good even for temperate climates, and piles made in summer are often quite hot to start with and liable to give trouble. Of course the converse is also true and piles

made in winter rarely give trouble; in fact it is said that ice and snow are sometimes found as late as midsummer in coal piles made at Glace Bay in midwinter.

Every precaution should also be taken to ensure that coal after being stored is not heated even locally from some external source. Coal piled near boilers, and particularly over or around hot pipes or flues is quite liable to develop violent spontaneous combustion. The action of the sun on a finished pile is on the other hand not likely to do harm as it is superficial and the heat gained in the day is usually lost in the night.

Porter and Ovitz cite a case in which a pile of cinders was observed to take fire due to the influence of heat radiated to them from a furnace. The cinders contained in one case 33 per cent., and in another 40 per cent. of carbon.

## MINE EARNINGS

The wonderful earning powers of American mines and works can best be illustrated by referring to the disbursements made by 167 companies during the 10 months of 1916. These companies, between Jan. 1, 1916, and Oct. 31, 1916, divided among shareholders the princely sum of $184,830,127. If the dividend payments of the securities-holding corporations were to be included (and a large proportion could be rightfully included), the year's total would reach $223,433,208, a wonderful and convincing argument that mining, as now carried on, is one of the principal reasons for America's present standing at the head of the world's great industrial centres.

That these companies not only enjoyed a remarkable prosperity during the past 10 months, but in previous years we are able to show by reports made to "Mining and Engineering World," that these companies paid dividends amounting to $1,067,277,064, which, with the dividends paid in 1916 makes a total of $1,252,107,191. This is a return of better than 133 per cent. on the combined issued capital of the companies. When it is considered that a large number of these companies did not pay a dividend previous to 1915 or 1916, this is a remarkable record and one, we believe, not duplicated by any other industry.

While October disbursements were not as large as during the previous month they were considerably larger than in any other October in the history of American mining industry. With 60 companies participating, dividends were paid to shareholders during the month totaling $16,663,385. This does not include the $630,000 disbursed by the holding companies. The copper companies distributed $7,517,580 of this, the gold-silver-lead-zinc companies $8,154,447 and the metallurgical companies $991,358.

Of the 167 companies participating in the 1916 disbursements 42 operate copper properties, all but two in the United States, and these divided among shareholders $88,280,814. In previous years these companies paid dividends amounting to $571,530,726, making their total to date $659,811,540. This is a return on the combined issued capital of 186 per cent.

One hundred nineteen properties, classified as gold-silver-lead-zinc producers, paid dividends during the 10 months of 1916 amounting to $77,149,398. Added to dividends paid in previous years brings their total to $380,088,724, on the combined issued capital of $309,979,039, a return of practically 124 per cent.

Of the 119 companies mentioned above 91 are operated in the United States and they have to their credit in 1916 dividend payments of $64,530,768. Added to the dividends paid previously brings their total to $294,657,558, a return of approximately 150 per cent. on the $197,644,778 outstanding.

Twenty-three of the above 167 companies operate properties in Canada and they contributed to the 1916, $9,210,621, making their total to date $69,522,318. This is a return of nearly 75 per cent. on the outstanding share capital and is a splendid record considering the comparatively few years of operation.

But three Mexican companies report as having paid dividends in 1916, these paying $1,108,009. To date these companies have disbursed $8,858,848.

Six metallurgical companies, looking to their profits largely from the treatment of ores for other companies had a very prosperous 10-months' period, for they disbursed among shareholders $19,399,915. Added to previous disbursements these companies have paid dividends totalling $212,206,927. This is a return of approximately 80 per cent. on the $273,003,040 oustanding share capital.

Eight securities-holding corporations, mentioned above, divided among shareholders during the 10 months of 1916, no less than $19,399,915. Since incorporation disbursements total $156,054,205. — Mining and Engineering World.

### CONSOLIDATED CO. ON VANCOUVER ISLAND.

The Consolidated Mining and Smelting Co. of Canada, Limited, owning the LeRoi and Centre Star-War Eagle group of gold-copper mines in Rossland camp, the Sullivan lead-zinc mine in East Kootenay, the big smelting and refining works at Trail, West Kootenay, and a number of other but less important properties in British Columbia, is reported to be extending its mining activities to the Coast district of that Province. Recently the company issued new stock, to provide for its expanding needs.

Although the Coast Copper Co., which has options on a large copper property in the Quatsino district, Vancouver Island, is not mentioned in the company's circulars, it is believed in some quarters that this is the company that has been taken over. The Quatsino properties at one time were under option to the Stewart Mining Co., operating in the Coeur d'Alene district of Idaho, but, following an adverse report from an engineer, the option was allowed to lapse. During the life of the option considerable development work was done, and it is said that the occurrence on the property of immense bodies of low-grade ore was proved. No deep development was done, however, and the belief prevails that only work at depth will reveal ore bodies of sufficient size and value to warrant operations on an extensive scale. It is said that in recent months engineers representing the Consolidated Co. have made exhaustive examinations and that their reports are satisfactory.

The Quatsino holdings are several miles from June Landing on Quatsino Sound, but a railway line has been surveyed from tidewater to the mine workings, and there is no doubt but that this line will be constructed if the Consolidated Co. makes the purchase. Nearly the entire distance will be heavy construction, owing to the mountainous nature of the region, but there are not any particularly difficult engineering problems to solve. June Bay is an excellent harbor and deep-sea vessels can easily berth at the landing, a condition that ensures cheap transportation to the smelting works.

## MINERAL RESOURCES OF GRAHAM ISLAND, B.C.

The Geological Survey, Ottawa, has issued a report, memoir 88, on the geology of Graham Island, B.C., written by Mr. J. D. MacKenzie. The southern islands of the Queen Charlotte group are known to contain several deposits of metallic minerals, the value of which has not yet been ascertained except in a preliminary way, and Graham island, the subject of this report, has long been considered to have deposits of coal, lignite, and petroleum. The search for workable bodies of these substances has been carried on at irregular intervals since 1859, and has lately been vigorously renewed.

The deposits of economic value found on Graham island comprise coal, lignite, clay, building stone and limestone and gold. Deposits of black tar also are found, but are not considered to indicate the presence of petroleum.

Coal is found in the Haida formation of the Queen Charlotte series, of Upper Cretaceous age. The coal has been exposed at several localities, and the seams show considerable variation, caused by original differences in deposition as well as by later changes. Coal seams have been prospected at Cowgitz and in the Slatechuck valley on Skidegate inlet; at Camps Robertson, Anthracite, Trilby, and Wilson, and near Yakoun lake, all in the interior.

On Skidegate inlet the seams dip at high angles and are much disturbed and the measures are intruded by volcanic rocks, which have changed the coal, which is ordinarily bituminous, to an anthracite variety. Somewhat similar relations are found near Yaoun lake, where the coal is also altered. At Camp Robertson the coal is well exposed in several prospect openings. One seam is found, which is folded and faulted in such a way that previous investigators have supposed that two or three seams existed. The maximum thickness of this seam is nearly 9 feet, and the maximum thickness of coal it contains is 3 feet 10½ inches, in several bands. The coal is hard and black, and is a low grade bituminous variety, high in ash. The horizon of the seam extends over a considerable area south and west of Camp Robertson, but some parts of this area may not contain coal. At Camp Anthracite south of Camp Robertson, the same seam is also exposed. At Camp Wilson the best seam of the district is exposed in several openings. It is from 4 to 18 feet thick, and in places contains 16 feet of coal. The seam is of much better appearance than the one at Camp Robertson, and the quality of the coal is also superior to the other, although it is rather high in ash.

Lignite occurs in numerous seams at Skonun point, and at other places on the north and east coasts. It is very tough and woody, and its value at present is very low; but it may prove to be a useful fuel in the future.

The clay deposits of Graham island are extensive, particularly in the northeastern part; but, so far as they have been examined, they are of low grade and suitable only for common brick and the cheaper varieties of plastic ware.

Stone suitable for building, should a demand for it arise, could probably be found in some of the more massive bands of the Haida formation on Maude island. Good limestone is found in abundance at the southeast end of South island.

The bituminous rocks of Graham island have attracted considerable attention of late years, and hopes have been entertained that extensive petroleum deposits would be eventually discovered. These hopes are not justified by the nature of the occurrences found and Graham island can scarcely be looked to as a future petroleum producer.

Gold is found on the Southeaster and Beaconsfield claims near Skidegate Indian village, associated with sulphides, in a quartz gangue. It is also found on the east coast of the island in beach placers.

## ANTIMONY ORE IN THE YUKON.

Newspapers published in Dawson City, Yukon Territory, and others in British Columbia, last month printed the following news concerning a reported strike of antimony ore up the Fortymile river:

A promising strike of antimony and silver has been made on the headwaters of the Fortymile. Ben Norvall is the discoverer. John Colver, who is in Dawson City from the head of the Fortymile, where he is mining on Chicken Creek, tells of the strike.

"Norvall made the strike," he says, "and several of us have staked claims, and are well pleased with them and intend to hold them. Assays made of the samples, which we sent to Colorado, show $125 a ton in antimony and also a heavy percentage of silver.

"The lead is 18 ft. wide on the outcrop, and well defined. Owing to the remote location the property cannot be opened now. What we need is a railway running near there.

"The property is 140 miles up the Fortymile river from Fortymile post, on the bank of the Yukon. That is too long a haul by sleigh to ever pay for handling the material. Since Uncle Sam is building railways in Alaska, he may start one in our direction some day, in which event we would have a chance to market the product of the new strike and other materials of the upper Fortymile. As it is to-day we confine our operations to producing gold, which can be taken out of the country at a profit.

"Quite a number of men are remaining in the Chicken creek and other localities of the upper Fortymile this winter. In coming to Dawson I had to cross country 200 miles, and walked all the way with the exception of the 60 miles from Glacier creek, which I covered by riding in with the mail carrier.

"Snow covers the trail all the way to within two miles of Dawson. From Ten-mile roadhouse out to Glacier the snow is plentiful and the sleighing good. I saw no caribou on the way in. In the Chicken creek district caribou, moose and other game are plentiful, so the miners will not want for fresh meat this winter.

## MOLYBDENITE MINING IN QUEBEC.

Within thirty-five miles from Ottawa, at a distance of two miles from the railway station of Quyon, a remarkable deposit of molybdenite has been developed by Canadian-Wood Molybdenite Co. The first shipment of ore was made in April, and since July 1 the shipments have averaged 250 tons a week of ore containing about 2½ per cent. molybdenite, which, for the three months ending September 30, will total approximately 75 tons of molybdenite. The ore is now being concentrated partly in Ottawa and partly in Denver, Colorado. The product is being shipped to London and to France. A concentrating mill is being put up as fast as possible near the mine.

## ENGLISH AND ENGINEERING.

Many engineers have expressed regret that in their undergraduate days they did not devote more attention to the study of English. The average engineering student is content to get along with as few courses in English as he can and not until too late does he realize that he has neglected to take advantage of a great opportunity.

It seems that the desirability of a good grounding in English is not sufficiently impressed on the student, and that the teachers of English are not overly anxious to have engineers in their classes. In a recent article in "Engineering Education," Mr. H. A. Watt in commenting on this attitude says:

"The English department has never relished the accusation of superciliousness which some of its friends of the professional schools have implicitly brought against it. And yet in our attitude toward the engineering and agricultural colleges can we be entirely absolved of the charge? Haven't we after all just a trace of academic Pharisaism, a feeling down in our hearts that we cultured ones are a little better than these hewers of wood and drawers of water, who must needs exist, but with whom the less we have to do the better? Aren't we tolerably certain that Keats and cows and Carlyle and carburetors can not by any possibility have a common denominator, and that the 'engineer' who desires a course in Shakspere or the 'agric' who has the temerity to tackle Browning are to be welcomed, perhaps, but regarded either as possible proselytes to our faith or as students not worthy of serious attention? The demand for the engineering and agricultural sections in freshman English at Wisconsin has never been a very insistent one. On the contrary, there is in the freshman English filing case a request from one of the older instructors in the department for 'all morning sections and no engineers or agrics, please, and this request is, I think, an expression of desire only slightly franker than most English instructors would be willing to make."

Commenting on the period in his college course when an engineering student is likely to reap the best results from a study of English, Mr. Watt says:

"Freshmen in professional courses are not as receptive to liberalizing study as are the seniors. They are narrow in point of view and regard with suspicious jealousy any encroachments upon their 'practical' studies. They fear the Greeks who bear gifts. It would be a difficult task for any English instructor to beat in the Philistinism of a commerce freshman of mine who wrote 'I am taking the commerce course so that when I get out, I can look the other fellow straight in the eye and do him on a strictly legitimate business proposition.' Three years of college might make such a student receptive to higher views; for this particular student the executive committee decided that one year of college life was enough.

"Another handicap is that the freshman's horizon is bounded by the June of his graduation, and his interests have not yet extended to the point at which he comes to have a vital interest in things bigger than his college affairs. The senior, however, realizes that the time of his departure into the great world beyond his graduation is painfully close, and he is beginning already to see the limitations of his college course as a genuine preparation for life. It is the senior in the professional schools, then, who will reap the greatest good from a contact with English as a liberal study.

"To substitute a required senior course for professional students for the freshman English course would not, however, be wise. No liberal English course for seniors such as I have in mind could be given excepting to students who had received the corrective drill which it is the aim of freshman English to provide."

Mr. Watt says of an advanced course for engineers:

"The course which I have in mind would aim specifically to teach students to think straight rather than to write correctly. Mere correctness of expression is the primary aim of the first semester's drill in freshman English; it would, therefore, be incidental in an advanced course. A liberal course in English composition for seniors in the professional schools should aim to stimulate rather than to impart bare facts. The professional school senior has been pumped full of facts. What he has not received in any definite measure is the ability in connection with abstract ideas to separate fact from theory, to weigh evidence, to recognize authority, to co-ordinate diverse elements, and to generalize safely, to grip, in other words, with any real mental vigor, once outside his world of facts, great questions of human interest. And yet this demand upon his intellect is absolutely certain to be made as soon as he leaves college."

Mr. Watt, who is an instructor in English at the University of Wisconsin, has in mind the engineering schools of the United States. Many of his remarks are, however, applicable to our Canadian institutions, though the tendency to narrowness is perhaps not so strong here as in some American colleges.

## PROFESSORS LECTURE AT THE PAS.

The Pas, Man., Nov. 17.—Mr. J. A. Campbell, Commissioner of Northern Manitoba, returned from Winnipeg on Tuesday. While in the city arrangements were made for a series of lectures on mining and mineralogy, prospecting and kindred subjects, to be delivered in this town, covering a period of about a week, from December 9th to 14th, inclusive. The lectures will be delivered by Professors Wallace and DeLury, of the University of Manitoba. These gentlemen are eminently qualified for the work in question, not only having the technical knowledge but they have a practical knowledge of this northern district, having spent some considerable time examining the mining regions to the north of here, during last summer. They have shown themselves alive to the situation, and have been conducting similar courses of lectures in Winnipeg, which have been largely attended. Owing to the distance from here, it has been impossible for those interested in this district to attend the Winnipeg lectures, and it is for this reason that the above mentioned arrangements have been made. This course will be a great boon to all the people of this northern territory, and especially those who have or expect to have anything directly to do with prospecting and mining developments.

The series will open with a general lecture of a somewhat popular nature, to be held on Saturday evening, the 9th prox., and there will probably be three sessions each day, commencing with the Monday following. The opening lecture, and probably the succeeding evening lectures, will be illustrated with lantern slides.

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The gold receipts at the Dominion of Canada Assay Office, Vancouver, B.C., in the month of October totalled 369 deposits, the value of the gold being $460,685.29, as compared with 238 deposits and a value of $457,973.58 for the corresponding month of 1915. The increase this year over last was 31 deposits and $2,711.71 in value.

## SHORTAGE OF MEN IN KOOTENAY, B.C.

A press despatch from Nelson, British Columbia, gives some information relative to the effect of the shortage of working men in East and West Kootenay and Boundary districts of that Province, as follows: Conferences held by Mr. R. F. Green, M.P., National Service Director for British Columbia, with mining men, lumbermen and other large employers of labor in this district have brought out the fact that southern British Columbia is suffering from a shortage of men, which has already reduced the output of raw materials used in war munitions.

On November 15, Mr. Green was in the Crow's Nest district, where he learned that the collieries there need fully 500 more men. The labor shortage has caused an insufficient supply of coke, which has had the effect of closing two copper furnaces at the Trail smelter and one at Grand Forks, while the British Columbia Copper Company at Greenwood would treat more ore and turn out more copper if it could get the coke to run another furnace.

Lumbermen tell a similar story of labor shortage. J. S. Deschamps, of whose production of lumber 80 per cent. is used in mining, told Mr. Green that he needed 100 men, but could get only 15.

Employers of labor without exception have urged that the ban on the admission of workers from the United States be lifted. They say there is no longer any reason for the embargo, which was imposed when hard times produced a flooded labor market.

Every man present at an open conference with Mr. Green expressed his desire to assist the National Board in its work of taking a census of Canada's man power. Recruiting in Kootenay and Boundary was stopped by the Militia Department several weeks ago because the district had been so drained of men that a serious decrease in the metal output was feared. The district produces zinc, lead and copper, all used in munitions, in addition to gold and silver.

Mr. James J. Warren, managing director of the Consolidated Mining and Smelting Company, told Mr. Green that Canada was saving money through buying metals in the Kootenays. The home production, in addition to permitting the Munitions Commission to make term contracts at favorable prices, prevented Canada being held up by foreign producers.

The British Columbia correspondent of the Canadian Mining Journal writes: "Concerning a reported 'Big Gold Strike Made Near Rossland,' relative to which a press despatch seems to have been given wide publicity, while I have no information, neither in confirmation nor contradiction of the published report, I desire to make known that I was at Rossland and Trail from Tuesday afternoon, October 24, to Saturday evening, October 28, during which time I did not notice any sign of excitement, which if it was general in Rossland on October 18, must have died down quickly, for not any one of the numbers I met in those towns in connection with a meeting of the Western Branch of The Canadian Mining Institute, to attend which I was in that neighborhood, even mentioned the matter to me. While I am not warranted in questioning the truth of the statement that a little high-grade gold ore was found on Murphy creek, as alleged, I think it well to suggest that judgment as to the importance or otherwise of the reported discovery be suspended until such time as its value from an ore-production point of view shall have been vouched for by some responsible official or other person."

## RAMBLER-CARIBOO MINES, LIMITED.

The following information concerning the affairs of the Rambler-Cariboo Mines, Limited, which company has for many years been operating a silver-lead-zinc mine, situated in McGuigan basin, Slocan district of British Columbia, was published on November 1, in Spokane, Washington, in which city is established the head office of the company. The president of the company is Mr. A. F. McClaine, and the statements are reported to have been made by Mr. A. F. McClaine, Jr.

"An addition of approximately $23,000 will be made to the resources of the Rambler-Cariboo Company in the sale of its zinc concentrates, just made through officers of the company upon which a telegram in confirmation has been received. Also, the company has preliminary notices from the smelting works reporting the treatment of silver-lead ore having a value in excess of $13,000. Other lots of silver-lead ore have been received at the smeltery or are in transit.

"The sale of the zinc ore was made to the United States Zinc Co., at Denver, Colorado. The lot is of 1,000 tons and it is on a dump at the company's concentrating mill alongside the Kaslo & Slocan railway. The rate of payment will be approximately $23 a ton, the average content being 34 per cent. zinc and 28 ozs. silver to the ton. Shipments on the 1,000-ton contract will be made to the plant at Blende, Colorado, as soon as railway cars can be obtained for its transportation, the buyer being desirous of early delivery.

"The value of four carloads of silver-lead ore treated in October at Trail, B.C., was, respectively, $4,200, $3,600, $1,100, and $4,500, a total of $13,400."

## OBITUARY.

The death occurred at Nanaimo, Vancouver Island, British Columbia, on November 3, of Mr. John Kirkup, Provincial Government Agent and Gold Commissioner for Nanaimo and district, as a result of blood poisoning and diabetes.

The late Mr. Kirkup was born at Kemptville, Ontario, in 1855, his parents being James and Hannah Kirkup, natives of Northumberland, England. He was educated in his native town, removed to Winnipeg, Manitoba, in 1876, and to Victoria, B.C., in 1877. In 1881 he entered the Provincial service at Yale, on the Fraser river. From that time until his death, he filled numerous Government offices at various towns in the Province. After a wide official experience he was appointed, in 1898, Government Agent and Gold Commissioner at Rossland, in which important and flourishing mining camp he had already been stationed three years. His annual reports, as Gold Commissioner, were always carefully prepared, and gave the chief features of the year's progress and results at Rossland mines. Several years ago he was transferred to Alberni, on Vancouver Island, and this year to Nanaimo. In 1891 he married Miss Kerr, daughter of Mr. Robert Kerr, of Kemptville, who with their two sons, survive him.

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The Idaho-Alano groups of mineral claims, on Howson creek, Slocan district of British Columbia, have been bonded by Mr. Clarence Cunningham of Spokane, who was already developing the Wonderful, the Queen Bess, and the Slocan Sovereign mines, all in the same district. The Idaho and Alamo were important producing mines in the nineties; a concentrating mill was put in alongside the railway about a mile below Three Forks, and an aerial tramway was constructed between mines and mill in those early days.

## GOVERNMENT OF THE YUKON.

Placer claims in the Yukon are held under the provisions of the Yukon Placer Mining Act, a statute of the Dominion House of Commons, while all other classes of mineral rights are administered under the provisions of Orders-in-Council passed by the Government of Canada.

The Yukon Territory Act provides for the appointment of a chief executive officer to be styled and known as the Commissioner of the Yukon Territory. An administrator may also be appointed to execute the office and functions of the Commissioner during his absence or illness or other inability. The Commissioner shall administer the government under instructions from time to time given him by the Governor in Council or the Minister of the Interior. By an order in Council of the 7th July, 1898, the Commissioner has power to suspend any official temporarily pending a decision by the minister of the department to which the suspended officer is attached.

The Yukon Council is composed of ten members elected to represent the electoral districts in the Territory. There are five electoral districts and two members are elected for each district. Any person who is qualified to vote is eligible for election as a member of the Council. All natural born or naturalized British subjects of the full age of 21 years and who have resided in the Territory for a period of twelve months prior to the date of election, shall be entitled to vote.

Every Council shall continue for three years from the date of the return of the writs for the general election, but the Commissioner may dissolve the Council and cause a new one to be elected. The Council shall be convened at least once in every year after the first session thereof.

## COST OF DREDGING IN YUKON.

### Working Costs.

Dredges are operating in the Yukon river in the beds and on the bars of the Klondike river, and also on the placer claims on Bonanza, Eldorado and Hunker creeks. Owing to the difference in the character of the ground, even in the same locality, dredges of the same make and bucket capacity may show entirely different working costs even under the same management.

Having determined the values which the property contains, the prime factor in dredging is to handle a maximum quantity of material in a given time. To accomplish this necessitates the highest percentage in working time.

### Dredging Cost Per Cubic Yard.

The following figures represent the operating cost of the Yukon Gold Co.'s eight dredges operating on Bonanza, Eldorado and Hunker creeks for one season. The yardage totalled 5,133,575 cubic yards, which produced $3,343,667, or an average of 65.3c per cubic yard. The average cost, including depreciation, was 29.53c per cubic yard made up as follows. Of the area dredged 68.4 per cent was frozen and had to be thawed by steam.

| | |
|---|---|
| Fixed salaries | $0.0008 |
| Labor | .0238 |
| Fuel | .0009 |
| Shop expense (repairs) | .0174 |
| Material and supplies | .0246 |
| Power | .0021 |
| Total direct | $ 0.0696 |
| Preliminary (accumulated during closed season) | $0.0228 |
| Taxes (renewal of grants) | .0005 |
| Bullion charges (mint refinery and government gold tax) | .0198 |
| General charges | .0185 |
| Depreciation | .0183 |
| Insurance | .0012 |
| Assay office | .0013 |
| Stables (hauling) | .0021 |
| Maintenance and depreciation of company's telephone lines | .0003 |
| Transportation | .0001 |
| Miscellaneous | .0051 |
| Total indirect | $0.0900 |
| Thawing | $0.1357 |
| Total operating cost | .2953 |

Detail cost per cubic yard for all dredges of the Yukon Gold Co., 1914:

| | Cents per yd. |
|---|---|
| Fixed salaries | .07 |
| Labor | 2.51 |
| Fuel | .05 |
| Shop expense (repairs) | .43 |
| Material and supplies | 1.86 |
| Power | 1.28 |
| Total indirect | 6.20 |
| Preliminary | 1.66 |
| Bullion charges | 1.67 |
| General charges | 2.44 |
| Depreciation | 1.67 |
| Insurance | .13 |
| Assay office | .15 |
| Stables | .23 |
| Company telephone lines | .03 |
| Miscellaneous | .05 |
| Development | .50 |
| Dredge construction | .71 |
| Total direct | 9.24 |
| Thawing | 12.18 |
| Total operating costs | 27.62 |

## BRITISH AMERICA NICKEL.

Mr. E. P. Mathewson, recently appointed general manager of the British America Nickel Corporation, is rapidly getting his staff organized, and it is evident that the company intends to go ahead in earnest. It is expected that the site for the company's nickel refinery will soon be selected. Development work is in progress at the Murray Mine, and arrangements are being made for the supply of power. Mr. E. Hibbert is in charge at the mine and has been appointed superintendent of mines. Mr. J. S. H. Wurtele is superintendent of power. Mr. Fred. J. Brule, who was with Mr. Mathewson at Anaconda, has been appointed chief engineer, and has started on his new work. Mr. J. E. McAllister will be consulting engineer.

The new offices of the company will be in the Royal Bank Building, Toronto.



George Black, Commissioner of the Yukon Territory.



The Honourable W. J. Roche, Minister of the Interior.

# PERSONAL AND GENERAL

Mr. Frederick J. Brule has resigned from the staff of the Anaconda Copper Company, to accept the position of chief engineer of the British America Nickel Corporation. He will reside in Toronto. Mr. Brule has been for some years in charge of important work for the Anaconda company.

Mr. J. S. H. Wurtele is superintendent of power for the British America Nickel Corporation.

Mr. E. Hibbert who has returned to Murray Mine after being seriously wounded in France, is now superintendent of mines for the British America Nickel Corporation.

Mr. C. E. Smith was in Toronto last week and is now in New York.

Mr. G. C. Bateman was in Toronto last week.

Mr. Robt. Bryce is in Toronto.

Mr. G. R. Bancroft, stated to represent the Tonopah-Belmont company, has taken a bond on a mining property on the north fork of the Telkwa, in Omineca mining division of British Columbia, owned by Messrs. J. L. Hatch and P. J. Powers.

Mr. W. H. Batty has been superintending work at the Tribune silver-lead mine, a few miles from Ferguson, Lardeau, B.C., for its owners, a Minneapolis company.

Mr. G. O. Buchanan, formerly of Kaslo, B.C., Supervisor of Lead Bounties for the Dominion Government, recently expressed the opinion that the silver-lead-zinc belt in Ainsworth and Slocan mining divisions of British Columbia, which he says offers a splendid field for investment, is now coming into its own with fresh capital available for development and a gradual increase in the amount of "imported money" being expended in it.

Mr. P. W. Clark, of Silverton, Slocan lake, B.C., general manager of the Galena Farm mine and concentrating plant, has returned to the mine from a visit to Spokane, Washington.

Mr. A. D. Cummings, of Duluth, has been investigating mining properties at the head of McGillivray creek, Lillooet mining division of British Columbia.

Mr. O. Drange, of Seattle, Washington, has been looking over a number of mineral claims in the Bella Coola division, British Columbia.

Mr. E. E. Emmons and associates have recently again been giving attention to their placer leases near the junction of Bear creek with Tulameen river, British Columbia.

Mr. W. Gardner, of London, England, secretary of the Tyee Copper Co., is still in Victoria, B.C. He has lately been negotiating with United States men for the sale to them of his company's smelting works at Ladysmith, Vancouver island, B.C.

Mr. W. J. Gifford is in charge of preliminary work being done on the Park group of mineral claims, near Kimberley, East Kootenay, B.C.

Mr. E. Hinman, Jun., stated to be acting for the Lewisohn interests, New York, has bonded a group of mineral claims situated on the Ecstall river, in Skeena mining division, British Columbia, owned chiefly by the estate of the late John Bryden, who was associated with the Dunsmuir coal mining companies on Vancouver island for a number of years.

Mr. J. F. Menzies, one of the best-known coal mine managers in the State of Washington, lately made an automobile tour through the coal mining regions of Vancouver island, B.C.

Mr. I. L. Merrill, of Los Angeles, California, president of the Hedley Gold Mining Co., early in November paid one of his periodical visits to the company's gold mine and 40-stamp mill in Camp Hedley, Similkameen district of British Columbia.

Major E. C. Musgrave, D.S.O., has been given the rank of Lieutenant-Colonel. He was formerly superintendent of the Tyee Copper Co.'s mine, on Mt. Sicker, Vancouver island, B.C., during its dividend-earning days. Afterward he was mining in Mexico. He was in England when the European war broke out and, having previously had four years' training at the Royal Military College, Kingston, Ontario, he soon obtained a captaincy in the King's Royal Rifles. He has been at the Front for about eighteen months, and during that period has been through some severe fighting, principally in the Ypres salient. He received his majority early last summer and was awarded the Distinguished Service Order.

Mr. W. G. Norrie, who last Autumn went from the staff of the Consolidated Mining and Smelting Co. at Trail, B.C., to superintend mining operations at the Silver Standard mine, near Hazelton, Skeena district, B.C., a short time ago found in that mine a new vein stated to contain 12 inches of solid ore—grey copper and zinc.

Mr. W. H. North, Silverton, B.C., local manager for the Standard Silver-Lead Mining Co., has been on a business visit to Spokane, Washington, and the Coeur d'Alene district of Idaho.

Mr. F. S. Peters, superintendent of the Le Roi mine, has returned to Rossland, B.C., from a visit to Nova Scotia.

Mr. M. E. Purcell, of Rossland, B.C., superintendent of the Consolidated Mining and Smelting Co.'s Centre Star-War Eagle group of mines, was in Spokane, Washington, last month.

Mr. J. C. Ryan, who controls the Soho mine, in Slocan district, British Columbia, has returned to Spokane, from the mine, on which development is being done.

Mr. Frank C. Stockdale is supervising development work on the Sitting Bull claim, in the Windermere mining division, East Kootenay, B.C. This property was recently bonded by Seattle men, who have organized the Sitting Bull Mining Co.

Mr. M. H. Sullivan (B.Sc. McGill, 1904), for several years assistant superintendent of the Consolidated Mining and Smelting Co.'s smelting works at Trail, B.C., has been appointed superintendent of the new smeltery the Bunker Hill and Sullivan Mining Co. is erecting at Kellogg, Idaho. He is expected to assume his new duties about the end of November.

Mr. Raleigh P. Trimble, manager for the Cassiar Crown Copper Co., developing a mining property situated near Telkwa, Omineca mining division of British Columbia, at the beginning of November went to Portland, Oregon, on a visit to his old home there.

Mr. Frederick Bradshaw, of Tonopah, Nevada, general superintendent for the Tonopah Belmont Co., is reported to have stated, after having visited the Surf Inlet gold mine, Princess Royal island, B.C., which his company purchased at the end of 1915, that the property is a valuable one and that he expected it will, when further developed, prove quite up to the expectations of the company.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA.

Dividend payments in the current year by metalliferous mining companies operating in British Columbia totalled $2,636,100 by the middle of November, and by a coal mining company $279,567; together $2,915,667. This total compares with $1,586,820 for the whole of 1915, and with $1,689,331 for 1914. Other dividends will be declared before the end of the year, so that a total for 1916 of at least $3,300,000 is confidently expected.

Cold weather having set in, the year's placer-gold mining season is practically at an end. Newspaper reports from the Atlin field, in the northern part of the Province, make it appear that about $400,000 is the total value of the season's yield from Atlin creeks. It is likely, though, that the official estimate will be lower than that sum, for it has been stated from time to time that the water supply for hydraulicking was not as plentiful throughout the season as in some other years, the gold recovery in which did not reach so high a total as that above mentioned. Cariboo and Quesnel divisions of the Cariboo district together gave a total value of $300,000 in 1915; it is not thought probable this year's yield will be higher, but advices as to the result of operations in 1916 have not yet been received.

### East Kootenay.

During the ten expired months of the current year, the total quantity of ore received at the Consolidated Mining and Smelting Co.'s smelting works at Trail from East Kootenay mines was 78,288 tons, which was more than twice as much as during the corresponding period of 1915. This considerable increase, however, was chiefly the result of much enlarged production from the Consolidated Co.'s Sullivan lead-zinc mine, the proportion of which was 76,846 tons. It is pleasing to find, though, that, with the exception of 766 tons from the same company's St. Eugene mine, nearly all the remainder was from mines that were not on the list of producers in 1915. Besides the two mines mentioned, ten properties made shipments to Trail, and since the end of October still another small shipper, from the northern part of the district, has been added to the list. It is evident, therefore, that mining is receiving more attention, and this, too, in parts of the district in which there had not been much, if any, production for a comparatively long while.

Several "bumps" in one of the mines of the Crow's Nest Pass Coal Co.'s Coal Creek colliery, which occurred on November 7, and several later days, have interrupted coal production there. First reports stated that ten men had been caught in the mine, but nine of them made their way out, leaving only one not accounted for, and it is feared that one has lost his life, rockfalls and caves of ground having prevented those who have been trying to find him from getting far into the mine. A press despatch from Fernie on November 14, stated that "this calamity has had the effect of minimizing operations in all mines here and is causing serious interruption in the coal mining industry. There is also a report of another demand from the miners of the district for increased pay, so that the present outlook for that part of the Province is not favorable. To what extent the supply of coke to the smelting works of West Kootenay and Boundary districts will be affected, can not yet be ascertained, but since all the operating smelting works of those districts are already hampered by a shortage of coke, the probabilities do not seem to be promising for an early improvement in conditions.

### West Kootenay.

**Ainsworth**—Seventeen ore-shippers from this division are on the Trail list as at the end of October, when the year's total of ore received from Ainsworth mines stood at 11,480 tons, as compared with less than 8,000 tons for the correspoding period of 1915. The larger shippers this year have been the Bluebell 4069 tons, Highland 2,645 tons, and No. 1, 2,381 tons. The No. 1 has been inoperative since the end of March, but the Highland, also owned by the Consolidated Company, has been a regular producer for the last six months. The Utica, in the western part of the division, with an output of 839 tons; the Florence, a mile or so north of the town of Ainsworth, with 834 tons; and the Comfort, across Kootenay lake, near the Bluebell, with 435 tons, are the only other shippers worthy of mention, the remaining eleven having all shipped less than 50 tons each. Good progress has been made in driving a long crosscut adit on the Crow Fledgling, this having cut the vein on which drifting is now being done. It has been announced that similar development work will now be undertaken on the Skyline, which is another property owned by Mr. A. W. McCune, of Salt Lake City, Utah, and situated near his Crow Fledgling and Krao mines.

**Slocan**—The ten months' shipments from Slocan mines to the Trail smeltery have totalled 13,300 tons, against less than 11,000 tons in 1915 to the end of October of that year. In addition, much zinc ore and concentrate has been shipped to United States reduction works. Twenty-two mines in Slocan division and four in Slocan City division are on the Trail list of shippers. The standard has made the largest production for the year, with 5,682 tons; the Rambler-Cariboo came next, with 1,598 tons, and then the Galena Farm, with 1,367 tons. Only three others made an output of silver-lead ore above 500 tons, namely the Slocan Star 924 tons, the Ruth 685 tons, and the Lucky Thought 572 tons. The Lucky Jim shipped 607 tons to Trail, chiefly of zinc ore. The Idaho-Alamo group, at the head of Howson creek, has been bonded by Mr. Clarence Cunningham, who is also operating the Queen Bess, Slocan Sovereign, and Wonderful mines. The Chambers group, near Cody, has been bonded, and it is reported the old Washington mine, situated across the gulch from the Rambler-Cariboo group, is to again be worked. Early completion of the new Hydro-electric installation for the Slocan Star is looked for. Shipment of 1,000 tons of zinc concentrate by the Rambler-Cariboo has been arranged for. The opening of a good shoot of galena on the Echo is announced.

**Nelson**—Efforts are being made to obtain the establishment of a custom stamp mill near Nelson. The Athabasca gold mine is to be again worked after having been idle for years. A neighbouring property, the California, is to be supplied with compressed air, for power uses, from the Athabasca mill. The development of the Granite-Poorman mines is being continued. The Eureka Co. is now operating the copper mine of that name, those who had been working it under option of purchase having relinquished their bond; shipment of ore to trail is to be resumed. The Silver King, on Toad Mountain, a few miles from Nelson, which has lain unworked for more than two years, is

to be further developed; during eight months of 1914, until shortly after the outbreak of the European war, 13,457 tons of silver-copper ore from this mine was shipped to Trail, but none since then. On the Fog Horn, in Ymir Camp, diamond-drilling is being done. The Relief, in Erie camp, is now operating a tube-mill at its stamp mill, also a cyanide plant. Molybdenite ore is being shipped from the Molly, situated in the southern part of Nelson mining division, to the works of the International Molybdenum Co., at Renfrew, Ontario; a published report states that three cars of ore have been shipped in the first half of November.

**Rossland**—The total quantity of ore shipped to Trail from Rossland mines in 1916 to the end of October was 269,287 tons; the proportions were: Centre Star-War Eagle group 150,935 tons, Le Roi 104,271 tons, Le Roi No. 2 (Josie) 13,957 tons, and Velvet 124 tons. Now that the coke supply is insufficient to allow of all the copper blast furnaces to be operated at the Trail smelting works, the Consolidated Co. has reduced the number of miners employed in its Rossland mines, and some of those not required there have gone to the company's Sullivan mine in East Kootenay.

**Trail**—The total quantity of ore received at the Trail smelting works during ten months of 1916, ended October 31, was 416,554 tons. The following summary shows the districts and mining divisions from which the ore was shipped to Trail: East Kootenay, 78,288 tons. West Kootenay: Ainsworth division, 11,480 tons; Slocan and Slocan City divisions 13,300 tons; Nelson division, 3,472 tons; Arrow Lake division, 8 tons; Trail Creek division (Rossland mines), 269,287 tons; Trout Lake division, 101 tons; Revelstoke division, 415 tons. Boundary: Grand Forks division, 7,010 tons. Yale: Nicola division, 298 tons; Ashcroft division, 41 tons; Kamloops division, 2,779 tons. Omineca division (Skeena), 603 tons. Alberta, 52 tons. Ontario, 268 tons. United States, 29,132 tons. Of the total, mines operated by the company sent 345,722 tons, and the remaining 70,832 tons was of custom ores.

### Alice Arm, Skeena Division.

The Esperanza group, also known as the Spanish group, has been bonded by a syndicate stated to be of men identified with the Granby Consolidated Co. Buildings and tramway are being put in order, preliminary to doing more development work. The chief value in the ore is reported to be in silver.

A compressor has been taken in for use on the Dolly Varden group of six claims, under bond to Mr. R. B. McGinnis, of San Francisco. A sawmill has also been put in. Work done in 1915 opened much fine silver ore on this property. This year's developments are reported to be satisfactory.

Work has been suspended by Messrs. Stilwell Brothers, of Seattle, Washington, on their molybdenum property, pending necessary changes and additions to the plant already installed.

### Atlin.

The agent at Atlin for the White Pass & Yukon route said recently that while many of the younger men of Yukon Territory and Northern British Columbia had volunteered for service in the European war, and were either at the front or in training preparatory to going there, the mining industry continues to be in a flourishing condition in Atlin camp. Most of the larger mining companies have been working to capacity during the 1916 season, and considerable attention has been given to the placer claims on Spruce creek and other gold-bearing streams in Atlin district. Lately, however, the customary Fall exodus had been taking place, and the last two steamers out had taken about 100 people, most of whom were men who had spent the summer and early autumn at mining work and were now going to various Coast places for the winter.

Occasional carload shipments of hydromagnesite are being made from Atlin, near which town there is a deposit owned by Messrs. Armstrong & Morrison, of Vancouver. Another Atlin product that has lately been attracting attention is lode gold from the Engineer mine, rich specimens of which have lately been exhibited in the Hotel Vancouver, Vancouver City, by Capt. J. Alexander, who is reported in newspapers to have stated that "not so long ago he refused $2,500.000 for the property which he expects will, in the course of a few years, yield him something like $1,000,000 per annum." That kind of talk seems to make acceptable "copy" for some of the newspapers.

### General Notes.

The Kitchener and North Star mineral claims, on Kuskanook mountain, three miles from Sirdar, which is near the western terminus of the Crowsnest railway, have been bonded by Calgary men, who are erecting buildings for the accommodation of miners they will keep employed on development work throughout the winter. Silver-lead ore occurs on these claims.

Mr. J. A. Schubert, of Tulameen City, who during last season did some placer-mining on Tulameen river, above Otter flat, has sent out 15 oz. of gold and 20 oz. of platinum. For one-half of the platinum, last sent out, he received at the rate of $62.50 per ounce.

The West Kootenay Power and Light Co. has completed and put in operation at one of its Bonnington Falls hydro-electric power-generating stations another 10,000-h.p. unit; this addition brings the available power up to 40,000 horse-power; the increase has been made to provide for the enlarged demands from the Consolidated Mining and Smelting Co.'s reduction and refining works at Trail, and for district mining and smelting industries generally.

In several of the older mining districts of the Province attention is being given to the development of properties on which little or no work had been done for years. This applies to East Kootenay, in both Fort Steele and Windermere mining divisions; to some parts of West Kootenay; to Yale district, in Nicola valley, Kamloops division, and in the mountains about Hope; and in some measure to the Coast district, which is showing progress in a similar direction.

### East Kootenay.

The Sullivan mine is the chief ore producer in this district, its output far exceeding that of the combined production of all other metalliferous mines in the district. For thirteen weeks ended October 21, the total quantity of ore received at Trail from all mines in East Kootenay was 37,823 tons, of which quantity 37,114 tons was from the Sullivan, leaving only 709 tons from all other mines. This large disparity may be expected to be continued for some years, since there is not at the present time any large body of ore opened elsewhere in East Kootenay.

A find of copper ore is reported to have been made on a claim on the middle fork of Spillimacheen river, in Northeast Kootenay. The locality is stated to be 22 miles west of Carbonate, and it is reached by pack trail.

### West Kootenay.

**Ainsworth.**—The output of ore is not now large, but a number of mines are being developed. Progress is being made with the construction and equipment of the concentrating mill for the Florence Mining Co. The Bluebell and Comfort, on the east side of Kootenay lake, continue to ship lead ore to Trail. In the western part of the Ainsworth division, the Utica is now doing well, and the development of the property at greater depth is shortly to be undertaken, the driving of an adit at a lower level having been resolved on.

Mr. W. J. McMillan, of Vancouver, is continuing his efforts to make arrangements that will render it practicable for him to ship antimony ore from the Alps-Alturas property, situated in the mountains above Three Forks and distant about ten miles from that place. The Kaslo "Kootenaian" recently published the following information: "Mr. McMillan is still endeavoring to arrange for a market for his product, but is handicapped by reason of the fact that there are no smelting facilities in Canada for treating this class of ore. The Alps-Alturas property was examined recently by Dr. W. F. Ferrier, on behalf of the Dominion Government.

**Lardeau.**—Dr. W. H. Willson, who in partnership with Mr. H. Y. Anderson, is operating the Beatrice mine, near Camborne, in the Fish river region of the Lardeau division, has given the Nelson "Daily News" the following particulars: "Remodelling of the tramway for shipment of ore from the Beatrice mine has been completed, and about two carloads of ore have already been taken out. The ore is being mined from a 4 ft. 6 in. shoot of rich gray copper ore on No. 1 level, and from 2 ft. 6 in. of steel galena on the intermediate level between Nos. 1 and 2. The gray copper assays about 100 oz. of silver to the ton and the steel galena 90 oz. silver, 25 per cent lead, and 28 per cent zinc. It is intended to ship the galena to Mr. M. S. Davys' magnetic separator, concentrator, and flotation plant at Kaslo, where a lead-silver and a zinc-silver concentrate will be produced. Twelve men are employed at the Beatrice; the number will be increased to 25 when rawhiding down the mountain shall be undertaken. Andy Daney, of Trout lake, has the contract for rawhiding, which is expected to be commenced about November 15.

### Coast District.

Much activity continues to be manifested in connection with the further extensive development of the Britannia Mining and Smelting Co.'s mining and milling properties in Vancouver mining division. Considerable quantities of mine and mill supplies are being received, as for several years past, and the number of men employed by the company is still large.

A most unlikely story relative to the value of copper ore reported to have been discovered recently near Cowichan lake, Vancouver Island, has been published in Provincial newspapers lately. The following excerpt is from the Vancouver "Sun": The most conservative reports of the property tend to show that there are three veins running throughout the length of seven claims registered. One of these is computed to be 60 ft. in width, another 40 ft., and a third 30 ft. Even the outcropping, taking the average of the three veins, has assayed 8 per cent pure copper, and Mr. C. H. Dickie, possibly the most expert man who has ever handled copper properties in Canada, declares that this property will prove to be fully the equal of the Granby mines, and infinitely superior to either the Flora or Tyee properties." While there is no reason to suppose that picked specimens of ore from this or any other deposit of copper ore will not give an assay return of 8 per cent copper, the statement that the average of the "outcropping" of three veins totalling 130 feet in width is as high as that, if supposed to be made by a dependable assayer, may be taken to be a simple fabrication. Further, the opinion may be given with confidence that Mr. C. H. Dickie, who has long been known as a very careful and conservative man in his statements for publication, and who certainly is likely to resent being styled "the most expert man who has ever handled a copper property in Canada" since he makes no such claims to such a distinction, and such a designation can only bring ridicule upon him, made no such statement as that attributed to him, for he knows far better than to compare an undeveloped prospect with such a property as that of the Granby Co. with its estimated reserves of nearly 20,000,000 tons of ore. It is a great pity city dailies publish such fiction as mining news.

### TORONTO MARKETS.

Cobalt oxide, black, $1.05 per lb.
Cobalt oxide, grey, $1.15 per lb.
Cobalt metal, $1.25 to $1.50 per lb.
Cobalt anodes, $1.50 to $1.75 per lb.
Nickel metal, 45 to 50 cents per lb.
White arsenic, 5½ to 6 cents per lb.

Nov. 24.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 16½ cents per lb.
Lead, 9 cents per lb.
Tin, 49 cents per lb.
Antimony, 18 cents per lb.
Copper, casting, 34 cents per lb.
Electrolytic, 38 cents per lb.
Ingot brass, yellow, 19 cents; red, 24 cents per lb.

Nov. 24—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $9.00 per ton.
Coal, bituminous, $10.00 per ton.

### SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| November 9th | 71⅞ | 34¼ |
| " 10th | 71⅞ | 34¼ |
| " 11th | 71½ | 34 1/16 |
| " 13th | 71¾ | 34 3/16 |
| " 14th | 71¾ | 34 3/16 |
| " 15th | 71¾ | 34 3/16 |
| " 16th | 71⅜ | 34 |
| " 17th | 71⅜ | 34 |
| " 18th | 71⅝ | 34⅛ |
| " 20th | 72⅛ | 34⅜ |
| " 21st | 72½ | 34 5/16 |
| " 22nd | 72⅞ | 34 13/16 |

### MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% $MoS_2$, $13.00 per unit.
Ores carrying between 3% and 5% $MoS_2$, $14.50 per unit.
Ores carrying between 5% and 10% $MoS_2$, $16.00 per unit.
Ores carrying between 10% and 15% $MoS_2$, $17.00 per unit.
Ores carrying between 15% and 20% $MoS_2$, $18.00 per unit.
80% concentrates $1.00 lb. of $MoS_2$.
Penalties imposed for copper and bismuth.

# MARKETS

## NEW YORK MARKETS.

Nov. 23—Connellsville Coke—
Furnace, spot, $6.50 to $7.00.
Furnace, contract, nominal, $4.00.
Foundry, prompt, $9.50 to $10.00.
Foundry, contract, $5.50 to $6.50.
Straits tin, f.o.b., 45.62½ cents.
Copper—
Prime Lake, nominal, 33.50 to 34.00 cents.
Electrolytic, nominal, 33.50 to 34.00 cents.
Casting, nominal, 32.50 to 32.75 cents.
Lead, Trust price, 7.00 cents.
Lead, outside, 7.20 to 7.25 cents.
Spelter, prompt western shipment, 12.67½ to 12.92½ cents.
Antimony—
Chinese and Japanese, nominal, 14.50 cents.
Aluminum—nominal—
No. 1 Virgin, 98-99 per cent., 64 to 66 cents.
Pure, 98-99 per cent. remelt, 58 to 60 cents.
No. 12 alloy remelt, 45 to 47 cents.
Powdered aluminum, $1.00 to $1.15.
Metallic magnesium, 99 per cent. plus, $3.50.
Nickel—
Shot and ingot, 45 cents.
Electrolytic, 50 cents.
Cadmium, nominal, $1.45 to $1.50.
Quicksilver, $80.
Platinum, $105.
Cobalt (metallic), $1.50.
Tungsten ore, per unit, 16 to 17 cents.
Silver (official), 72⅞ cents.

Metal Products.—Following base prices represent mill quotations:—
Sheet copper—
Hot rolled, 41 cents.
Cold rolled, 42.00 cents.
Copper wire, 40 cents.
Copper wire, January, 38.75 cents.
Full lead sheets (f.o.b. mill), 8.50 cents.
Cut lead sheets (f.o.b. mill), 8.75 cents.
Sheet zinc (f.o.b. smelter), 19 cents.
London—by cable—
Standard tin, spot, £191.
Standard tin, futures, £193.
Straits tin, spot, £191.
Easter price c.i.f. London—delayed.
Standard copper, spot, £144.
Standard copper, futures, £139 10s.
Electro copper, spot, £164.
Spelter, spot, £57.
Spelter, futures, £55.
Lead, spot, £30 10s.
Lead, futures, £29 10s.
Silver (official), 34 3/16d.
Ferromanganese—
Prompt (f.o.b. seaboard), $162 to $165.
Imported on contract, $164.
Domestic on contract, $162 to $165.
Ferrosilicon, 50 per cent.—
Eastern freight allowed. Prices nominal.
600 ton lots, $90.
100 ton lots, $91.
Carload lots, $92.
For 1917 contracts 50 per cent., carload lots, $100.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)

As of close November 23rd, 1916.

### New York Stocks.

| | Bid. | Asked. |
|---|---|---|
| Can. Car. | 40.00 | 50.00 |
| Curtiss Aeroplane | 25.00 | 30.00 |
| Can. Copper | 2.06 | 2.18 |
| Canada Cement | 68.00 | 72.00 |
| Howe Sound | 7.50 | 8.00 |
| International Nickel (new) | 46.50 | 46.75 |
| Kennecott Copper | 57.75 | 59.00 |
| Midvale Steel | 69.25 | 69.50 |
| Marconi | 3.12 | 3.37 |
| Steel of Canada | 75.00 | 80.00 |
| Steel and Radiation | 35.00 | 45.00 |
| Submarine Boat | 41.00 | 42.00 |
| Tonopah Extension | 5.25 | 5.50 |

### Porcupine Stocks.

| | Bid. | Asked. |
|---|---|---|
| Apex | .08⅞ | .09 |
| Dome Extension | .28½ | .29½ |
| Dome Lake | .60½ | .61 |
| Dome Mines | ... | 23.50 |
| Eldorado | ... | .00½ |
| Foley O'Brien | .70 | ... |
| Gold Reef | .04½ | .05 |
| Hollinger | 6.95 | 7.00 |
| Jupiter | .27½ | .28 |
| McIntyre | 1.77 | 1.78 |
| McIntyre Extension | .51 | .53 |
| Moneta | .15½ | .17 |
| Davidson | .63½ | .64 |
| Porcupine Crown | 69½ | .70 |
| Porcupine Imperial | .03 | .03⅛ |
| Porcupine Tisdale | .00¾ | .01½ |
| Porcupine Vipond | .37½ | .39 |
| Preston East Dome | .03¾ | .04 |
| Lally Gold Mines | .15 | .15½ |
| New Ray | ... | 1.15 |
| Bonanza | ... | .12½ |
| Kenabeek | .24½ | .25 |
| Teck Hughes | .55 | .57 |
| Schumacher | .70 | .71½ |
| West Dome | .34 | .34½ |
| Inspiration | .20 | .30 |

### Cobalt Stocks.

| | Bid. | Asked. |
|---|---|---|
| Adanac | .25 | .30 |
| Bailey | .07⅝ | .08 |
| Beaver | .45½ | ... |
| Buffalo | 1.05 | 1.25 |
| Chambers Ferland | .17½ | .18 |
| Coniagas | 4.85 | 4.90 |
| Crown Reserve | ... | .45 |
| Foster | .03 | .06 |
| Gifford | .04 | .05½ |
| Gould | .00¼ | .00⅜ |
| Great Northern | .09½ | .09¾ |
| Hargreaves | .04¾ | .05⅛ |
| Hudson Bay | 61.00 | 75.00 |
| Kerr Lake | 4.95 | 5.00 |
| La Rose | .52 | .60 |
| McKinley | .60 | .62 |
| Nipissing | 8.90 | 9.12½ |
| Ophir | .11 | .11¼ |
| Peterson Lake | .18 | .18½ |
| Right of Way | .05¼ | .05½ |
| Rochester | .03½ | ... |
| Seneca Superior | ... | .07 |
| Shamrock Consolidated | .17 | .17½ |
| Silver Leaf | .01½ | .01⅞ |
| Temiskaming | .65½ | .66 |
| Trethewey | .17 | .17½ |
| York Ontario | 01¼ | ... |
| Wettlaufer | .08½ | .09 |
| Lorrain | .50 | ... |
| White Reserve | 35 | .35½ |

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Canada Metal Co., Ltd.

## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 5
Armstrong, Whitworth of Can., Ltd. . . . . 10

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
Beatty, M. & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
Berger, C. L. & Sons . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd. . . . . 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co. . . . . 6
Canadian Explosives, Ltd. . . . . 14
Canadian Industry, Commerce and Finance. . . . . 3
Can. Ingersoll-Rand Co., Ltd. . . . . 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. . . . . 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Concentrating Ores by Flotation 4
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . .Outside Back Cover

D

Dept. of Mines, Canada. . . . . .Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd. . . . . 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fraser & Chalmers, Ltd. . . . . 4
Fuller, A. S. & Co. . . . . 12

G

Gartshore, J. J. . . . . 4

H

Hassan, A. A. . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11

I

Imperial Bank of Canada . . . . . 6
Industrial & Technical Press. . . . . outside back cover
International Molybdenum Co. .. 6
International Nickel Co. . . . . 6

J

Johnson, Matthey & Co. . . . . 11

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

Mines Handbook . . . . . 2
Murphy, Chas. J. . . . . 11
Mussens, Ltd. . . . . 1 0

N

Nova Scotia Steel & Coal Co.... 4
Nova Scotia, Province of..... 8
Northern Canada Supply Co., Ltd. 7

O

Ontario, Province of . . . . . .Inside Back Cover

Q

Quebec, Province of . . . . . 8

S

School of Mining . . . . . 5
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 11
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2

T

Tyrrell, J. B. . . . . 11

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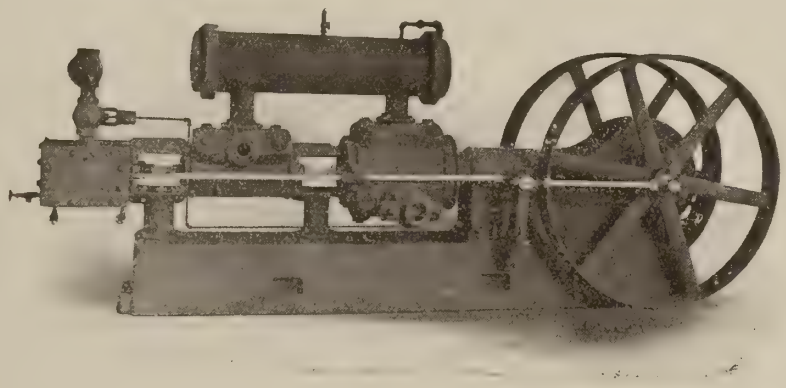
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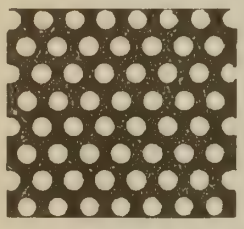
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The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

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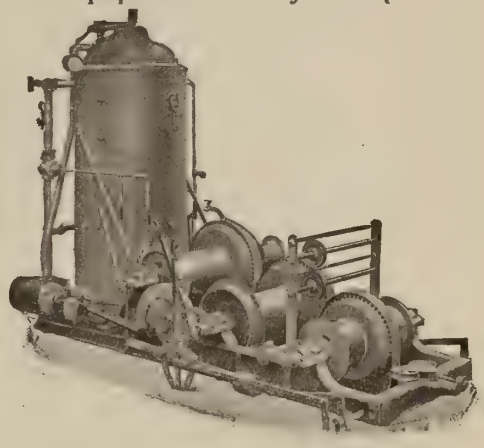
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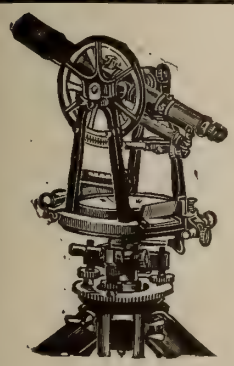
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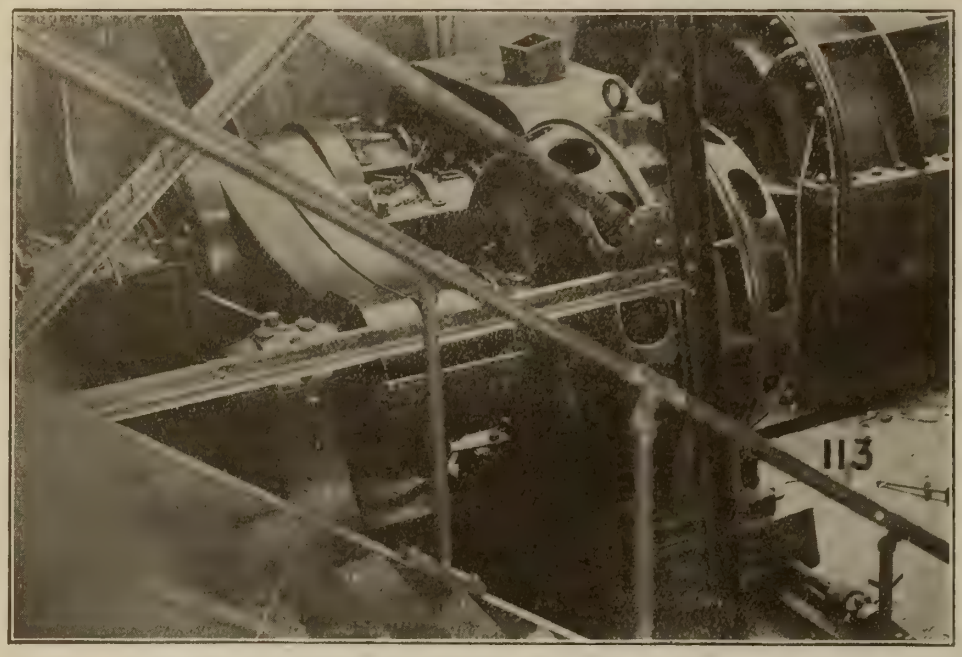
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# THE CANADIAN MINING JOURNAL

VOL. XXXVII. TORONTO, December 15, 1916. No. 24

## The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

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*Head Office* - - - 263-5 Adelaide Street, West, Toronto
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REGINALD E. HORE

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CONTENTS

| Editorials— | Page |
|---|---|
| Scientific and Industrial Research | 575 |
| An Inventory Needed | 576 |
| The Lindsey Episode | 576 |
| The Iron and Steel Industry in Nova Scotia, by F. W. Grey | 579 |
| Iron and Steel Castings, by J. H. Hall | 581 |
| Steel Making in the Electric Furnace | 583 |
| Mr. Dewart on German Control of Metals | 588 |
| Gold Mines of Kirkland Lake District | 591 |
| Special Correspondence | 594 |
| Markets | 597 |

## SCIENTIFIC AND INDUSTRIAL RESEARCH

The impetus given to research by war time necessities has been frequently noted. An excellent example is furnished by the efforts of the Nipissing Mining Company to combat the increasing cost of supplies. In the November issue of the Bulletin of the Canadian Mining Institute, Mr. R. B. Watson says:

"Before the war, aluminum dust cost 33.82c. and caustic soda 2.11c. per pound, laid down at the mine. At the expiration of our contract for aluminum dust in May 1916, the lowest price at which dust could be bought was 90c. per lb. and caustic soda had risen to 5.77 per lb. At these prices, the increased cost for these two chemicals would have amounted to about $33,000 per year. This was excessive and necessitated the finding of a substitute immediately. The utilization of sodium sulphide as a precipitant appeared to present the most promising solution of the difficulty, and the experiments carried out by J. J. Denny, in charge of the Company's research department, were so satisfactory, that in June, 1916, the process was adopted for the precipitation of all the mill solutions. It would appear, that even when prices of all chemicals used return to normal, sodium sulphide precipitation will be cheaper than the method formerly employed."

In the application of research to industry the Nipissing Mining Company has been signally successful. Mr. Watson and Mr. Denny are to be congratulated on their methods and results. They have made a valuable contribution to the metallurgy of silver and at the same time increased the profits of their company.

Another recent success to be credited to the Cobalt district, and particularly to Mr. Thos. Jones of the Buffalo Mining Company and Mr. A. A. Cole of the T. and N. O. Railway Commission, is the development of a pine oil industry. With the co-operation of the Forestry and Mines Departments a successful process for utilizing red pine stumps has been worked out. Pine oil, one of the chief products of distillation of red pine, is in great demand by those using oil flotation processes for concentrating ores. It is not unlikely that the Cobalt silver district will soon be able to obtain in Ontario all the pine oil required. In fact there is ground for believing that the industry may result in Ontario being an exporter of pine oil.

Another satisfactory development in Ontario is the promising results being obtained at the University of Toronto by Mr. Geo. Guess and his assistants, who are working on the problem of refining nickel. Mr. Guess is working for the Ontario Nickel Commission and is, we understand, meeting with considerable success.

In this connection another interesting series of experiments is being carried on in Toronto by the Moffat Irving Steel Company. Quite recently this company has made nickel steel in Toronto directly from roasted nickel ore.

The application of scientific research to industry is an every day occurrence in mining and metallurgy. The war has created new demands which are being met by renewed efforts.

While recognition of the value of scientific research is no new thing in the mining industry it is new in some industries. During the past year the public has begun to appreciate the fact that closer relations between scientists and business men are desirable. Some of our scientists have not been slow to appreciate the fact that scientific and industrial research is the popular thing. Adopting the methods of a well known Toronto broker, they have recently been taking advantage of every opportunity to shout "I know something." The sequel is seen in the appointment of an advisory council on scientific and industrial research. We cannot congratulate Sir George Foster on his choice. An advisory council made up of men who have had some experience in the application of science to industry might be of great value to the country. So far as the mining industry is concerned we do not expect much help from the council as at present constituted. Nor do we see that other industries are likely to receive very valuable advice from these men.

## AN INVENTORY NEEDED

Elsewhere in this issue we publish extracts from a speech on the nickel problem by Mr. H. H. Dewart. Mr. Dewart points out clearly how Germans have controlled the metal trade of the world. He exposes some of the schemes whereby the citizens of other countries are deceived by the agents of the metal trust. His remarks lead us to expect that if he were not so bound by party ties, Mr. Dewart might do some real service to the country in helping to rid us and the Empire of undesirable German influence. Unfortunately Mr. Dewart, after the manner of most of our politicians, weakens his arguments by charging his political opponents with responsibility for everything that is done wrong and for all unsatisfactory conditions that exist or that he claims exist.

Mr. Dewart continues to make charges against the Provincial and Federal Governments and against the International Nickel Company without presenting very strong evidence to support his charges. The Government continues to deny the charges and so far we have no good reason to believe that Mr. Dewart's remarks concerning Canadian nickel reaching Germany are for other than political effect. We are at a loss to understand however why a politician should make such charges merely to further the interests of his party. This is no time for such methods.

Ignoring what Mr. Dewart says about his political opponents, there are to be found in his statements some facts that should be known to every Canadian. Only when they are known and appreciated may we hope to rid ourself completely of German influence in the mineral industry.

In order that we may know who controls our industries we should have an inventory.

Every company operating in Canada should be called upon to give an account of itself. We should have on record at Ottawa the name, nationality and extent of the holdings of every shareholder of every company operating in Canada. There should be on record, a statement concerning affiliation with companies outside of Canada. Companies which refuse to give the desired information and those found guilty of giving false information should not be allowed to operate in the country.

## THE LINDSEY EPISODE

As a political stroke, it is likely that most of our readers consider Mr. Dewart's reference to the Lindsey letter anything but a success. Many speak of it as a boomerang, and so it appears to us. It seems likely however that the publicity given to the incident may prove useful to the country even though it has not proven good party material.

In the first place it is well that the public should know that if a Russian company wishes to buy Canadian nickel it cannot obtain it in Canada nor through any Canadian company or agent. It must make its purchases through the firm of Merton & Co. The fact that this firm is now under British control does not wholly satisfy us. Is there no truly British firm in England that could have handled the business? If not, is it because the influence of the German firm was so great that no independent Britisher was able to carry on successfully trade in metals won from British ores?

In the second place it is no credit to Canada that Mr. Lindsey was forced to tell his Russian clients that the Sudbury nickel we brag so much about is not on sale in Canada, but that we only ship out the matte which is refined in other countries by non-Canadian companies and sold by them through a lately-German company.

### IRON AND STEEL.

A bulletin, by John McLeish, on the iron and steel industry of Canada has just been published by the Mines Branch, Ottawa. It contains much useful information concerning progress in 1915, some of which is included in this number of the "Journal."

## NIPISSING.

The November report of the manager of the Nipissing mine shows that during the month of November the Company mined ore of an estimated value of $246,629 and made shipments from Nipissing and Customs ores of an estimated net value of $372,636.

Development work on vein 490 was generally satisfactory during the month. Vertical development, by means of several raises, continued to show ore of good width and assay above the fifth level. Most of the raises are up about 70 ft. and with one exception, the condition of the vein above the fault is about as good as the width and assay below the fault. One raise shows as high as 8 to 10 ft. of ore assaying 1,500 to 1,800 ounces. In addition to the vein itself, the raises are continuing to develop a very good grade of mill rock. A fifth raise has been started at the north end of the ore shoot and is up 30 ft. This end of the vein is more up than the rest and principally produces mill rock of high assay. This raise will be continued to the fourth level and will be one of the main sources of ventilation in future stopes on this vein. The north drift is being continued on a small stringer running parallel with the property line, and will eventually be driven to the vicinity of vein 98, where a faulted extension of that vein is expected to be found. The south drift has been temporarily stopped in order to allow the starting of several new crosscuts. During most of the month, values in this drift have been low, running from 10 to 75 ozs. The face of the drift has occasionally been of high enough value to send to the low grade mill. Four new crosscuts have been started and as the adjoining territory has favorable possibilities, good results are looked for as this work progresses. The usual amount of stoping was done on veins 73 and 98 and their various branches.

At 80 shaft most of the work was confined to crosscutting at the third and fourth levels. Nothing of a favorable nature was found during the month. At shaft 81, no new ore shoots were found since the one encountered in October. At the 425 ft. level there has been a vein of niccolite and smaltite, having a width of 2 to 6 in. but as a general rule, silver values were low. Occasionally, the vein was of sufficiently high assay to send the entire product to the mill dump. At the 520 ft. level there have been no favorable results outside of occasional amounts of smaltite having a width of 6 in. The second level is now within 60 ft. of the boundary line and the third level still has 200 ft. to go. As soon as this amount of drifting has been completed, some vertical development will be started. The adjoining property had good ore on the same vein at a height of 125 ft. above the 425 ft. level.

Operations in R. L. No. 402 consisted mainly in stoping two veins found by past development and these are producing a good grade of rock for the low grade mill. Some drifting has also been done on one of the veins and during most of the month, results have been fair. The vein is a small one but occasionally it shows as high as 2 in. of 5,000 ounce ore. No new developments were met with on vein 102.

The high grade mill treated 162 tons and shipped 490,782 ounces of fine bullion. The low grade mill treated 6,462 tons. The following is an estimate of production for the month of November.

| Washing Plant | Low Grade Mill | Total |
|---|---|---|
| $139,081 | $107,548 | $246,629 |

## MEMBERS OF STANDARD MINING EXCHANGE VISIT PORCUPINE.

As guests of Mark Harris & Co., a party of nearly forty spent the American Thanksgiving week-end at Porcupine. Mr. Harris had invited the members of the Standard Mining Exchange to visit the Newray property, in which his company is particularly interested and also the leading producing properties, the Hollinger, Dome and McIntyre.

Two special cars, attached at Toronto to the "Cobalt special" on Wednesday evening, carried the party to Timmins. From Timmins the visitors drove to the Newray mine and spent Friday morning at the property. In the afternoon McIntyre and Hollinger mines were visited. Saturday was spent at the Dome and the party returned to Toronto on Sunday after a very interesting and enjoyable trip.

The Newray property was formerly known as the Rea. In our issue of Nov. 1, 1910, was given some account of early developments at the property, then known as the Connell.

In 1911 a company, Rea Consolidated Mines, Limited, was incorporated to work the property. Development of a very promising vein was for a time quite satisfactory. A small body of good ore was blocked out. Further development was however disappointing, the vein at the third level proving very lean. Efforts to locate another ore shoot on the vein were fruitless.

Development work was then for some time discontinued. The developed ore was mined profitably and then operations were discontinued.

A new company, the Newray Mining Co., is now operating the property. According to the manager, Mr. C. P. Charlebois, this company has had considerable success in its prospecting work. A number of veins have been uncovered and tested by pits and diamond drilling has encountered good ore. The mine is now being unwatered.

Mr. Charlebois and Capt. A. C. Anchor conducted the visitors over the Newray property and explained what had been done and the character of the results obtained.

The party then visited the McIntyre mine where Manager Ennis gave all an opportunity of going underground. At the Hollinger the chief object of interest was the plant for handling and treating the ore. The foundations for the mill addition are completed and by next April the company will be in a position to handle nearly double the present tonnage.

On Saturday, Mr. Jos. Howston, assistant general manager at the Dome, showed the visitors over the Dome property.

The trip to Porcupine cannot fail to leave a good impression on the members of the party. The gold mining industry is playing an important part in the development of Northern Ontario. Everyone who visits Porcupine sees evidence on every hand of big things being done and of good results being obtained.

## INDUSTRIAL RESEARCH IN ENGLAND.

London, Dec. 1.—The Government has decided to establish a separate Department of Scientific Industrial Research, over which the Marquis of Crewe, Lord President of the Council, will preside. Subject to the consent of Parliament, a large sum will be placed at the disposal of the department for the conduct of researches for the benefit of national industries.

## IRON AND STEEL IN 1915.

The year 1915, particularly the later months, was marked by a steady renewal of activity in the iron and steel industry, due not so much to industrial demands for Canadian consumption, as to the requirements of steel for munitions and the export demand for billets and wire.

The shipments of iron ore are the largest recorded with the exception of 1902. The production of pig-iron was practically equivalent to that of 1911, having been exceeded only in 1912 and 1913, while the production of steel ingots and castings was exceeded only in 1913.

### SUMMARY OF CANADIAN IRON AND STEEL STATISTICS, 1915.

| | |
|---|---|
| Iron ore shipped | 398 112 tons |
| Canadian iron ore charged to blast furnaces | 293,305 " |
| Imported iron ore charged to blast furnaces | 1,314,957 " |
| Iron ore charged to steel furnaces | 74 872 " |
| Pig-iron made | 913,775 " |
| Pig-iron and ferro-alloys exported | 26 545 " |
| Pig-iron imported | 47,842 " |
| Ferro-alloys made | 10 794 " |
| Ferro-alloys imported | 13,758 " |
| Pig-iron and ferro-alloy consumption | 959,254 " |
| Pig-iron used in steel furnaces | 747,834 " |
| Steel ingots and castings made | 1,020 336 " |
| Steel rails made | 232,411 " |
| Canadian coke used in iron blast furnaces | 578 743 " |
| Imported coke used in iron blast furnaces | 486,022 " |
| Iron and steel imported | 771,007 " |
| Number of completed blast furnaces | 19 |
| Number men employed in blast furnaces | 1 004 |
| Wages paid in blast furnaces | $675,453 |
| Value of pig-iron produced | $11,374 199 |
| Value of iron and steel goods exported (c) | $48,268,148 |
| Value of iron and steel goods imported | $74 308,983 |

Canadian iron blast furnaces continue to be operated largely on imported ores and fuels, only about 17 per cent. of the ore consumption and 54 per cent. of the fuel used in 1915 being of domestic origin.

The imports of iron and steel which reached a maximum in 1913 show a further falling off in 1915 amounting in value to just half that of the former year. The exports, however, continue to increase, the value in 1915 being over three times that of the exports in 1914.

During the earlier months of the year, low prices, a restricted market, and sharp competition pressed heavily upon the operators forcing the marketing of steel at the lowest possible margin. As the year progressed, however, the enormous demand for munitions and war requirements rapidly absorbed available stocks until before the close of the year market requirements could not be met. The installation of new open-hearth furnaces was undertaken at several plants, while a number of small electric furnace units were also constructed and others projected in an attempt to meet the demand.

## CANADIAN IRON MINES.

Active mining operations were conducted at three iron mines during 1915, viz.: The "Helen" and "Magpie," in the Michipicoten district, and the "Moose Mountain," north of Sudbury. Small shipments were made from stock at two other properties.

The total shipments during the year were 398,112 tons, valued at $774,427, as compared with 244 854 tons, valued at $542,041, shipped in 1914. Of the total shipments in 1915, 308,382 tons were sent to blast furnaces in Canada and 89,730 tons to the United States.

The shipments included 205,989 tons of hematite, 132 906 tons of roasted siderite, and 59,217 tons of magnetite (including some ores with an admixture of hematite). Shipments in 1914 included 89 454 tons of hematite; 109,838 tons of roasted siderite, and 45,562 tons of magnetite.

All iron properties in the eastern Provinces of Nova Scotia, New Brunswick, and Quebec were idle throughout 1914 and 1915, although small shipments were made from Bathurst mine stock of 3 683 tons in 1915 and 4 775 tons in 1914. These ores would average about 46 1-2 per cent. iron.

In Quebec the Manitou Iron Mining Co. opened up their mine at Ivry-on-the-Lake in Terrebonne county on Dec. 4th 1915, and undertook to make considerable shipments of ilmenite during 1916.

In Ontario the "Helen" and "Magpie" mines were operated throughout the year by The Algoma Steel Corporation.

The Moose Mountain mines, at Sellwood, Ont., owned by Moose Mountain, Limited, were operated for less than two months closing down on May 28th, 1915.

The mines of the Canada Iron Mines, Limited, "Bessemer" and "Childs" in Mayo township and Coe Hill in Wollaston township, as well as the magnetic concentrating plant at Trenton, remained idle throughout 1915, although a small tonnage of concentrates was sold during the year.

## WINDY ARM, SOUTHERN YUKON.

A correspondent of the Daily Alaskan, published at Skagway, tells of mining at the Venus and other mining properties in the neighborhood of Windy Arm, Southern Yukon, as under:

On November 4th, the ninth and tenth shipments of ore were made from the Venus mine, in Southern Yukon. One lot was shipped to the Granby Consolidated Co's smelting works at Anyox, Observatory Inlet, B.C., and the other to the Consolidated Mining and Smelting Co's smeltery at Trail, B.C. The latter lot of ore contained enough lead to pay railway freight and other charges from tidewater at Vancouver to Trail.

These shipments complete a total of more than 8,000 sacks, amounting to approximately 500 tons of ore shipped from the Venus mine since operations were commenced this season for transporting the ore. The launch Pelican is being used to take the place of the steamer Gleaner, which is being repaired. After the water in the lake shall freeze, horse teams will be used in hauling the ore from the mine landing to Carcross on the White Pass and Yukon railway.

Ice is still being taken out of the shaft of the Montana mine, near the Venus, though a depth of 180 ft. has been reached. The ice is very solid, and it will probably be found to extend to the bottom of the shaft.

# THE IRON AND STEEL INDUSTRY IN NOVA SCOTIA

By F. W. Gray.

The smelting of iron ores and the manufacture of steel in Nova Scotia is an outgrowth of the coal mining industry, and the location of the iron and steel plants has been determined by the proximity of large deposits of bituminous coal. Half a century ago it was popularly supposed that Nova Scotia possessed valuable iron ore resources, and large hopes were based on the supposed juxtaposition of coal and iron deposits. Unfortunately these hopes were not realised, and iron smelting enterprises in Nova Scotia based on a local ore supply have been disappointing failures. If the unique and marvellous deposits of iron-ore in Conception Bay had been unknown, it may be conjectured that the presence of coal in Nova Scotia would have developed an iron and steel industry within the Province on a small scale, just as the English ores were used before the development of modern practice in steel manufacture required an ore supply of greater dimensions than the English deposits could provide. It is interesting to note that the restrictions placed on ore shipments by war conditions have led to a revival of iron-ore mining in Great Britain at the present time, and it may be that the iron deposits of Nova Scotia, meagre as they are believed to be, would have been differently regarded had the Wabana supply not been available.

There has lately been a disposition on the part of the public to awake to the valuable nature of the iron-ore beds of Bell Island. The tardiness of this awakening is surprising, because the potentialities of the combination of the iron ores of Wabana and the coal beds of Cape Breton have not lacked advertising, and with the exception of the prevailing high prices for steel and the insistent demand that has caused this enhancement of prices, there is really nothing new in the situation. The most optimistic view of the steel industry could not hope to outshine the forecast of the original prospectuses of some of the steel companies of Nova Scotia. A survey of the natural advantages possessed by Cape Breton Island in its combination of coal-seams of good quality, with excellent facilities for water transportation, immense beds of limestone and the proximity of the Wabana ore deposits, causes one not so much to wonder at the optimism of those who founded the steel industry there, but rather to wonder why their forecasts have not been fulfilled.

Without going into figures it might be quite safely stated that the iron ore beds of Wabana and the coal areas of Cape Breton are inexhaustible, for the purposes of this generation at any rate. The advantages just enumerated as possessed by Cape Breton may be regarded as permanent, so that the future of the industry is a matter of markets and prices.

Reference is made particularly to Cape Breton, because the only steel works outside of Cape Breton are those of the Nova Scotia Steel & Coal Company at Trenton, and these may be regarded as an extension of the operations in Cape Breton.

The present state of the steel industry is one of insistent demand and production at high pressure. Activity is almost entirely confined to the production of shell steel, and the manufacture of shell bodies. The production of other steel products is reduced, not so much from lack of demand, as because of the necessity for the production of munitions steel. The present activity is of course entirely a reflex of the war, and presumably the coming of peace will bring with it a lessening of activity. Peace seems, however, to be a remote possibility in these days, and as the months go by the end of the war acts like the end of the rainbow in the fable. The steel companies look like having to be content with busy times for an indefinite period ahead and the knowledge that no matter when the end of the war arrives, they are helping to bring it nearer by concentrating all energies on the production of munitions and munitions steel.

The period preceding the war and the first eight months of the war were times of great trade depression and financial stress. Lack of capital prevented many necessary improvements in the plant, and even the carrying out of necessary repairs, and it may be anticipated that before disbursing profits in dividends to shareholders the directors of the steel companies will see to it that sufficient money is expended to place the steel plants in position to meet the strain of after-war conditions, and the recession of activity that is inevitable at some future date which no man can name.

Extensive plans for improved and enlarged plants are now in contemplation or under way at the several steel plants, including such factors of increased production as additional coke-ovens and new blast furnaces, and a notable step is the commencement of the building of steel ships by the Nova Scotia Steel Company at New Glasgow. It is understood that this company intend not only to build steel ships, but to engine them also, and there seems reason to hope that this is an embryo industry which will persist when after-war times are with us and grow to proportions that will put Nova Scotia once again into a prominent place in the shipbuilding industry.

One interesting development of war conditions is the recovery of benzol and its derivatives from coke-oven gases by the Dominion Steel Corporation. The object of this recovery at the present time is of course to obtain toluene, the base of the high explosive familiarly known as "t.n.t". After the war it may be anticipated that a market will be found for benzol, and it may be taken for granted that the War Office will in future keep a friendly eye on every possible source of toluene.

The steel industry of Nova Scotia has progressed a long way in the direction of manufacturing finished steel products. The Dominion Iron & Steel Company is now equipped to manufacture large quantities of nails of every conceivable variety, barbed and fencing wire, wire rods, bars, etc. The Nova Scotia Steel Company at Trenton fabricates a considerable variety of forgings, shaftings and commercial shapes, and it cannot be doubted that great advance in the manufacture of more finished iron and steel products will take place in the near future.

Generally speaking, and without particular reference to the iron and steel industry, it may be anticipated that future years will see from Nova Scotia a lessened export of coal as a raw material, and an increased export of manufactured articles; because, after all, the iron and steel industries have their genesis in the presence of coal-seams, and the growth of these industries is but an example of what might be achieved in Nova Scotia in many other branches of manufacture.

As to the future, in so far as it depends on war

conditions, The Earl of Derby has recently said that the man is a fool who will undertake to prophesy. All we know is that peace will come when the Germans are beaten, and in this process the iron and steel industry of Nova Scotia is assisting to the best of its ability. There are, however, certain elements of permanence in the industry that cannot be taken away, and above all, Canada industrially is yet in its infancy. There seems no good reason why the most optimistic forecasts of the future of the industry should not some day be fully realised.

## SCHWAB AND FISK.

Charles M. Schwab is undoubtedly a wizard on steel and his ability in this line and his unbounded enthusiasm have both contributed to the success that has been attained by the Bethlehem Steel Corporation, of which he is IT, being the company, the board of directors and the stockholders.

The assets value of his enthusiasm is well illustrated by the story that in the early days of Bethlehem Steel, when Mr. Schwab needed money and had made several unsuccessful efforts to raise it, he went to Pliny Fisk.

In Mr. Schwab's inimically enthusiastic manner he told of the wonderful possibilities of Bethlehem Steel, which so impressed Mr. Fisk that he agreed to raise the money but insisted that Mr. Schwab should put all he had just told him on paper. Mr. Schwab immediately returned to his own office and wrote the letter and despatched it by a messenger.

Soon he got a telephone call from Mr. Fisk. The latter expressed great indignation because Mr. Schwab had not included in the letter many of the things he had told him during their interview. Mr. Schwab now very much incensed rushed around to Mr. Fisk's office and proved to him finally that nothing of what he had said was missing from the letter.

"Well," said Mr. Fisk, "you do seem to have it all in but it don't sound right. If you want me to raise that money for you, you will have to talk into a phonograph."

## WABANA IRON ORE.

The iron ore deposits at Wabana, Newfoundland, are owned and operated by the two Canadian companies operating coal mines and steel plants at Sydney and Sydney Mines, Cape Breton. The shipments from the Wabana mines during 1915 were 868,451 short tons, of which 802,128 tons were shipped to Sydney and 66,323 tons to the United Kingdom. The total shipments from Wabana since the mines were first operated in 1895, have amounted to 15,525,636 short tons, of which 9,726,881 tons were sent to Sydney; 2,078,197 tons to the United States, and 3,720,558 tons to Great Britain and Europe.

## PIG-IRON IN 1915.

The total Canadian production of pig-iron in 1915 not including the output of ferro-alloys, which is separately tabulated, was 913,775 short tons (815,870 long tons) valued at $11,374,199, as compared with 783,164 short tons (699,256 long tons), valued at $10,002,856 in 1914, and 1,128,967 short tons (1,008,006 long tons), valued at $16,540,012 in 1913. An increase of 16.67 per cent. is shown in the production of pig-iron in 1915, as compared with a decrease of over 30 per cent. in 1914.

Previous to 1896 pig-iron was made entirely from Canadian ores. Since that date, however, increasing quantities of imported ore have been used as well as imported fuels and fluxes, and in 1915 about 83 per cent. of the ore charged, 46 per cent. of the coke, and a large proportion of the limestone were imported. The iron industry at Sydney and North Sydney has been built up on the basis of the Newfoundland Wabana ores and the local coal supply, while in recent years a portion of the limestone required has also been obtained from Port au Port, Newfoundland. In Ontario large quantities of United States "Lake ores" are used, the imported ores charged being 623,094 tons, and Canadian ores 293,305 tons, in 1915. All the fuel used, with the exception of a small quantity of charcoal, was imported either as coke, or as coal, for charging the by-product coke ovens at Sault Ste. Marie. A portion of the limestone flux is also obtained from quarries situated in the United States.

## IRON ORE PRICES.

The prices of Canadian iron ores are naturally based on prices current in the United States. "Lake ores," that is, those originating in what is generally known as the Lake Superior iron region, and which contribute about 80 per cent. of the iron and steel requirements of the United States are, by agreement amongst the principal operators, quoted per gross ton delivered at Lake Erie ports. Ore prices and freights are usually fixed at the beginning of each season and the price of any individual ore then depends on its variation from the standard in iron and phosphorus content, etc.

The urgent demand for iron ore by United States blast furnaces during the later months of 1915 resulted in general buying for 1916 delivery early in December, and the fixing of prices for the 1916 season at 75 cents per ton in advance of the 1914 and 1915 quotations, which have been as follows:

| | 1914 and 1915 | 1916 |
|---|---|---|
| Old Range Bessemer | $3.75 | $4.50 |
| Mesabi Bessemer | 3.50 | 4.20 |
| Old Range Non-Bessemer | 3.00 | 3.75 |
| Mesabi Non-Bessemer | 2.85 | 3.55 |

The base for Bessemer ores is 55 per cent. iron natural, and .045 per cent. phosphorus dried at 212 degrees Fahrenheit.

The base for Non-Bessemer ores is 51.5 per cent. iron natural.

Since 1900 the price for Old Range Bessemer ores has ranged between a minimum of $3.00 in 1904 and a maximum of $6.48 in 1900. Non-Bessemer ores being generally from 50 to 80 cents lower.

Ore prices in eastern United States are generally quoted at a rate per unit delivered eastern Pennsylvania points on tidewater. Thus in 1914 and 1915, Newfoundland, Nova Scotia and New Brunswick ores sold in this market, would bring from 6 to 8 cents per unit, or per cent. of iron. The 1916 prices range from 8 to 8 1-2 cents per unit for 50 per cent. to 65 per cent. ore.

On Nov. 23, 1916, the prices for 1917 were established at $1.50 above those ruling in 1916. Fifty cents of the advance goes to the lake vessels.

## TRETHEWEY.

Trethewey shareholders have been advised that a dividend of five per cent., is to be paid on Dec. 22. The disbursement will come in the nature of a Christmas present, as there was little expectation of further dividends for some time to come. The payment will involve the amount of $50,000 and will aggregate over $1,110,000 paid to date to shareholders. The property had been closed down for over a year on account of the low price of silver, but was reopened in May when the white metal displayed a soaring tendency.

# IRON AND STEEL CASTINGS

At a meeting of the International Engineering Congress last year, Mr. John H. Hall presented a paper of considerable interest to those who make or use iron and steel castings. He said in part:

Iron and steel castings may be made of steel, malleable iron, or cast iron. Though there are a number of trade names for particular sorts of metal sold in the form of castings, yet all belong to one of these three classes— which have distinctive properties,—are manufactured by different processes, and have different fields of usefulness. We hear, for instance of "semi-steel", "gun-iron" or "wrought iron" castings; however, these are but special sorts of castings—the first two of grey iron, the last of steel castings.

Steel castings are made of steel, which may be hard or soft, of high or low carbon, with or without special alloys, just as steel forgings or rolled steel shapes are made of different sorts of steel. Cast-iron castings, of course, are composed chiefly of pig-iron, generally remelted, and are distinguished by the comparatively low tensile strength and almost total lack of ductility characteristic of that metal, which is attributable largely to its high content of carbon. In some sorts of iron castings, part or all of the metal is made almost glass-hard by casting it against an iron chill, whereby the carbon is retained in the "combined" state as carbide of iron, an intensely hard substance. But in most cases iron castings are comparatively soft and readily machinable, and at least a considerable part of the carbon is in the form of flakes of graphite, which are distributed through the metal as flakes of mica might be mixed in mortar, destroying its continuity and rendering it weak and brittle.

Malleable iron might be called a mongrel iron. When first cast, the metal throughout its cross-section is very hard and is identical in nature with the chilled portion of a chilled-iron casting. By heating this hard, brittle metal for many hours at a full red heat, it is made soft and quite ductile. The combined carbon is thereby all converted to graphite, which, however, is in the form of globular aggregations of very fine powder and is not in flakes, as in grey iron. The portion of the metal near the surface of the castings, moreover, is made nearly carbonless. Thus the metal is practically dead-soft steel whose continuity is broken up by aggregations of a strengthless material. It is, therefore, quite ductile and has a fair degree of strength, but, naturally, is not as strong or as ductile as dead-soft steel.

From this brief statement of the general nature of the three metals, we see that they have necessarily distinct fields of usefulness. We use steel or malleable-iron castings when we need a metal with a considerable amount of strength and ductility; in most cases, indeed, our reason for using a casting, instead of forming the piece of rolled or forged metal, is that it can not be so made; or because the expense of the rolling, forging, or cold-shaping of steel plate would be prohibitive. Many times the choice between a steel casting and a drop forging, for instance, is dictated simply by the number of pieces we shall require; if we need a great many, we can afford to make dies, and we secure a better, and often cheaper, article; whereas, if there are but a few required, we are constrained to use castings, because of the expense involved in the purchase of forging dies.

When we order cast-iron castings, on the other hand, we generally wish to use them for parts in which great strength is not required, often because the weight of the piece is of no consequence, or even because a heavy piece is an absolute essential. By using a large piece of comparatively weak and brittle metal we secure the total strength required. The metal, moreover, is very strong against compressive stresses, and is often used to resist such stresses in cases where comparatively heavy sections can be used.

**The choice between steel and malleable-iron castings** is dictated partly by their respective properties, partly by price, and partly by the limitations of the processes by which malleable iron is made. As already stated, steel is, in its nature, a more homogeneous metal, and therefore tougher and stronger than malleable iron. Moreover, castings of malleable iron are somewhat prone to actual porosity or sponginess at the center, especially in certain portions of irregular castings, so that for this reason, also, a steel casting is stronger and more reliable. Finally, malleable iron can be made only into castings of quite light sections; whereas, there is almost no limit to the size and weight of steel castings that can be produced. For uses where only a fair amount of strength and toughness are necessary, and the casting is, therefore, of light section, it often pays to buy malleable castings, because they are cheaper than steel.

**The variations in the properties of steel castings** are due to variations in the composition of the steel, to the annealing or heat treatment to which the steel is subjected, and to the soundness of the casting. The last of these may be summarized in the familiar saying, "a casting is always a casting"—by which the "initiated" mean that it may always contain hidden blow-holes or shrinkage cavities that cause or aid its failure when least expected. The gases that are liberated from solidifying steel, of course, cause blow-holes in ingots as well as in castings, but by the time the ingot is reduced to the rolled or forged shape, these holes are at least closed up, if not partially welded—and they are generally so located as to be least harmful to the finished piece. In the case of castings, the gas from the metal and the steam and gas set free from the sand mould may cause blow-holes that can not be detected by surface inspection of the piece.

Because steel and iron contract in cooling, moreover, there is a tendency toward the formation of a cavity in the upper portion of almost any mass of metal during its cooling from the liquid state to atmospheric temperature. In rolled and forged work we get rid of the hollow part of the ingot simply by not using it. In castings, however, especially steel castings, we provide against these cavities by putting extra portions upon the piece, which are so shaped and located that they, and not the casting itself, shall be hollow. The metal drained from these "sink-heads" feeds the shrinkage of the casting, and they are knocked or cut from the piece after it has grown cold. Failure to properly locate or design these heads will almost certainly give rise to shrinkage cavities of greater or less size in the casting; and if these are so located as not to be discovered and welded up, we have a hidden source of weakness in our casting.

The most important constituent of steel, upon which the nature of the metal largely depends, is carbon. Depending upon the carbon content, ordinary steel castings vary from very soft to dead-hard steel. The carbon content in each class of steel castings is approximately as follows:

| Class. | C. Per Cent. | Special Trade Names |
|---|---|---|
| Very soft | up to 0.15 | "Malleable-Iron Castings" |
| Soft | 0.15 to 0.30 | |
| Medium | 0.30 to 0.40 | |
| Hard | 0.40 up | "40-Point Steel" |

The effect of silicon in steel castings is chiefly to promote soundness and to discourage the formation of blow-holes. The average silicon content of steel castings is from 0.25 to 0.40 per cent, though in "very soft" steel it is sometimes as low as 0.15 or even 0.10 per cent. The silicon content should not be specified by the purchaser but left to the judgment of the maker.

Manganese, in "very soft" steel castings, is sometimes as low as 0.20 per cent., but in the average casting it runs from about 0.40 per cent. to 0.80 per cent., or even higher. As manganese additions are absolutely essential in the manufacture of steel, and in most cases the steel could not be made sound at all without it, the manufacturer is in a position to know how much he should use and should not be hampered by limits imposed in specifications.

The effect of phosphorus in steel is to produce brittleness in the metal when cold. Hence the limits are sharply specified. No steel casting should contain over 0.10 per cent. of phosphorus, and 0.08 per cent. is better. For high-grade castings the upper limit is generally 0.05 per cent.

Sulphur is a harmful impurity in steel, its chief effect being to make the metal "red-short", or weak and brittle when hot. Steel that has to be rolled, forged or quenched from a red heat in hardening, therefore, must contain as little sulphur as possible. As the purchaser of steel castings very seldom forges them at all, or subjects them to hardening processes, many makers of steel castings contend that the sulphur content should not be specified. As they point out, the almost inevitable effect of too much sulphur in their steel is that the castings will crack when hot under the stresses set up during the cooling, so that there is no incentive for the steel maker to take chances on the use of steel of too high a sulphur content. They contend, therefore, that they should be allowed to settle the sulphur content of their steel for themselves, as they will be sure not to allow too high a content and should not be embarrassed by specifications that may call for a much lower sulphur content than is really necessary, at an added expense to them. Most specifications for steel castings, however, contain a maximum limit for sulphur, usually from 0.05 per cent. to .06 per cent.

**The effect of annealing and heat-treatment,** in general, is more marked in high-carbon than in low-carbon steel. One effect, however, that is practically as great in soft as in hard steels, is to relieve the stresses that are set up by the unequal rates of cooling of parts of a casting of varying cross-section. As soft steel contracts more in cooling than does hard steel, the stresses are generally somewhat greater in soft castings. This is offset by the fact that as the steel is tougher it can have more stresses in it without danger of failure; so that the question of stress is nearly as important in a soft as in a hard casting. Able metallurgists have contended that soft-steel castings need no annealing, but the tendency has long been to anneal more, rather than less, often.

Plain annealing, that is, heating the casting to a given temperature, which is maintained for some time, and then cooling it slowly, breaks up the coarse micro-structure characteristic of steel in the cast condition and substitutes for it a much finer and more uniform structure. The result is to raise the strength and elastic limit of the casting, to a degree that is generally the greater the higher the carbon content of the metal, the strength of very soft castings being raised very little by annealing. The toughness of the metal, as measured by its extension and contraction of area in the tensile test, is also increased, more in high carbon than in low carbon steel. As measured by bending tests, the toughness is also greatly increased; and though hard steels are improved more than soft, yet the difference between an unannealed and an annealed soft-steel casting is usually greater in the bending test than in extension or contraction of area.

Heat treatment, that is, heating the casting to a given temperature for a given time, to relieve cooling stresses and remove the coarse micro-structure of the cast metal; cooling more or less rapidly, to partially or entirely harden the metal; and reheating to relieve the hardening stresses and to "draw" part of the hardness, is, of late, being practised to an increasing extent. Its effect is similar to that of plain annealing, but more marked. The strength and toughness of the steel are greatly increased, the effect upon the lower carbon steels being more marked than is that of plain annealing. This is especially true of the resistance to sudden shock. A dead-soft steel, of so low a carbon content that the effect on the strength of even a drastic heat treatment is hardly noticeable, is made several fold as resistant to shock tests as it is in the annealed condition.

**The method by which the steel is made** influences its properties largely by its effect upon the composition that it is possible to secure, and upon the tendency of the steel to unsoundness. The "basic" processes, by which are meant those in which the slag can be so regulated as to permit the removal of most of the phosphorus and sulphur of the steel, naturally enable the manufacturer to secure low phosphorus and sulphur content, whereby the steel is made tougher when cold and less prone to shrinkage cracks. When the steel is made by "acid" processes, on the other hand, purity must be attained by the use of pure raw materials, at an increased cost. Moreover, lower phosphorus and sulphur content are secured by basic processes than it is possible to attain by acid processes.

Again, the extent to which the steel is subjected to oxidation during its manufacture influences the tendency to unsoundness. It may be said, in general, that the Bessemer process oxidizes the steel to the greatest extent, the open-hearth process to a less degree, the crucible process to a still less degree, and the electric-furnace process least of all.

It is not possible to state dogmatically that one process produces better steel than another, because the raw material used and the skill of the operator vary to a considerable extent. Even with the electric furnace, very poor steel can be produced by the inexperienced men; though, when properly handled, the furnace is capable of producing metal that is as low in phosphorus and sulphur, and as pure and little liable to blow-holes, as any steel the world has seen. Hence the process by which the steel is made is, in many cases, of less importance than the skill and knowledge of the workmen, so that the purchaser is better protected by calling for metal of good properties as exhibited by tests than by buying castings made by some particular process that he supposes to be the best. Even electric furnace steel is subject to this statement. It does not give results, in the ordinary tests,

much better than can be obtained with steel well made by some of the other processes; and the growing use of the electric furnace in steel foundries is due as much to the fact that it possesses certain technical advantages for the manufacture of high-grade small castings, as to the superior excellence of the steel made in it. We know, of course, that electric furnace steel is proving itself superior to other steels, as for instance, in rails subjected to severe winter weather. But the inevitable uncertainties of steel castings prevent our designing them on as close a margin as we do forgings, so that, as yet, the actual properties of the steel in good steel castings are quite as high as the trade desires. In fact it is quite possible to make a much better steel than there is a market for.

The most important special steels used in castings are chrome steel, nickel steel and manganese steel. The chrome steel used is generally of a very hard grade, and is furnished for crushing and grinding parts, such as stamp shoes, cement-mill balls, etc. Nickel steel is used in castings for the same reason that it is used in rolled and forged material, because a metal of high tensile strength and elastic limit and of good ductility is required.

Manganese steel is in a class by itself. It is unmachinable, quite strong, very tough, and extremely resistant to wear. It is used to resist almost all sorts of heavy wear and abrasion in crushing and grinding machinery, steam-shovel and dredge parts, railroad frogs and switches, etc.

The best way to secure satisfactory castings is to prescribe the tests that the metal must meet, such as strength, ability to withstand a certain hydraulic pressure without developing leaks, machinability, etc., and leave the composition to the maker, who can generally be depended upon to choose the composition best suited to the requirements. The maximum sulphur, and sometimes phosphorus, content, may be specified, but the engineer should be careful not to go so far in this line as to unnecessarily embarrass the foundryman.

Electric or blow-pipe welding of blow-holes and shrink-holes in steel castings is now a practice recognized in specifications. If the defect is not so located as manifestly to make the casting unfit for use, and if the defect is properly repaired, a welded casting is perfectly satisfactory. The defect, however, should be really eliminated, not simply plugged. By opening a hole to the bottom with the flame or arc, much as a dentist prepares a cavity in a tooth for filling, and then filling it with metal that is welded to the partially fused walls of the hole, the casting can be made truly sound. The hardening effect of the high temperature and rapid cooling upon the steel adjacent to the weld, especially in medium and hard castings, and the stresses set up by the cooling of large welds, makes it essential, in a great many cases, that the casting be reannealed after welding. This is especially true if the welded face must be machined.

In genreal, the problem of making satisfactory castings is so intricate that the purchaser should beware lest he impose impossible conditions upon the foundryman. Specifications should be drawn so that they do not specify both the properties to be obtained and the method of obtaining them. Often, too, a casting is asked for that can not be made successfully at all unless the design is altered. The foundryman becomes, through long experience, an expert in the production of sound castings, and the good engineer should endeavor to co-operate with him and modify design (and often specifications) in accordance with his suggestions. By so doing he will find, in the majority of cases, that he will secure far stronger and more reliable castings than if he gets on his high horse and refuses to listen to the foundryman, with the result that the latter just does the best he can, and turns out what he knows must be an inferior piece of work which he could greatly improve were his knowledge and skill called into consultation.

## STEEL MAKING IN THE ELECTRIC FURNACE.

Progress in chemistry and metallurgy has kept pace with the world's ever increasing demand for steel, but the instrument with which to apply our knowledge has not always been at hand. At first it was possible to obtain steel-making materials in sufficient quantities and of such purity that steel of fine quality could be made by a simple process requiring little real technical knowledge. As the demand for steel grew, and with it the necessity of lowering the cost, the supply of pure material did not suffice to meet both these conditions. New processes were invented by which steel could be made by the elimination of deleterious elements in the raw material by the use of various chemical reactions. The Acid Bessemer, Acid Open Hearth, Basic Bessemer and Basic Open Hearth processes followed one after the other. Tremendous tonnages were made by these processes, but they did not displace the crucible when the highest grade was required.

All our processes required the application of heat, and all known means of applying heat carried with them oxidizing conditions from which we were not able to protect the material under treatment. We could eliminate objectionable metalloids and we could add alloys giving various striking and beneficial qualities, but our only means of getting rid of oxygen, for which steel has such a greedy appetite was by the introduction of materials which had a still greater affinity for oxygen, but which could never grasp the last traces of oxygen, and which left in the steel certain quantities of their own oxides.

Though the oxides in steel are often more deleterious than moderate quantities of the supposedly more objectionable elements, there has been more or less mystery about them because a ready and practiced every day method of measuring the quantities of these oxides in all the steel we make has not been introduced. But the reason why we did not succeed in making the highest grades of steel in large quantities was because of the lack of an instrument rather than lack of knowledge.

The discovery of the electric furnace gave us the instrument we require to make steel free from all the objectionable elements, including oxygen and sulphur. In this process we use a clean heat. Whether we employ the arc furnace or the induction furnace, the use of kilowatts instead of flame can in no way add oxygen to the metal. Certain elements, as carbon and phosphorus, must first be oxidized before their elimination, and it is necessary to introduce materials, such as iron ore, to give up their oxygen to the elements to be burned. When this is done we can proceed to purify the metal bath from all contaminating oxides, because an overlying slag is supplied which absorbs the oxides, which are in turn broken up, allowing the oxygen to unite with carbon and pass out of the furnace as a gas.

We have in the electric furnace not only a neutral or non-oxidizing condition, but a really reducing con-

dition. We are able to throw sulphur into a basic slag, as in the blast furnace, where the process is one of reduction, but with the conditions existing in the electric furnace we can eliminate the traces of sulphur which cannot be removed in the blast furnace.

Now that the instrument as well as the knowledge has been secured, the use of the electric furnace in steel making must become general unless some still more perfect method is devised, and provided that electric steel can compete with steel made by other processes in cost of production.—J. H. Gray.

## IRON AND STEEL MARKET.

**Pittsburgh.**—The most important development in the steel trade is the placing of large orders for shell steel, for shipment in second half of 1917, which the steel trade regards as furnishing additional assurance that high prices and intense production are to continue through next year. By itself, the argument would not be conclusive, as the allies cannot take chances and if they needed steel would buy even though there were distinct possibilities of our steel market easing off next year. The continued pressure for steel from domestic buyers, the buying of pig iron for delivery in second half of next year at fancy prices, and various other circumstances tend to support the view that present conditions are not to be altered for the worse for another twelvemonth at least.

## NICHOLS COPPER CO.

Almost two years to the day from the time it paid its last previous dividend the Nichols Copper Co. has resumed disbursements to stockholders with a declaration of $4 a share to be paid late this month. Up to December, 1914, not less than $6 per share was maintained for some time.

## ORIGIN OF THE OPEN-HEARTH PROCESS.

It was in 1857 that Siemens invented the regenerative furnace, but not until 1861 did he take out a patent for what we now know as the open-hearth; and even then he did not see that a new problem had arisen and that his furnace had almost miraculously appeared just when it was needed, for the Bessemer process had just come into use and large quantities of steel scrap were being produced. Numerous attempts were made to "pile" and weld this scrap, just as always has been done with wrought iron, and schemes of this kind were quite common even in the early eighties; but the welding of Bessemer scrap at that time was out of the question, because practically all the output was rail steel, while a large proportion was too large to be made into any ordinary "bundle."

For a long time after the regenerative furnace had been in operation for heating purposes it was not realized that steel scrap could be melted on an open hearth, and large piles of crop ends and defective blooms accumulated without any practicable method in sight for their utilization. But in 1864 two brothers, named Martin, operated a furnace at Sireuil, in France, and worked out the method, which is so familiar to us to-day, of melting pig iron and scrap together. They obtained patents a year later, and for a long time it was the general custom to speak of the Siemens-Martin or, more briefly, the S. M. process; but to-day we commonly refer to it as the open-hearth. These patents for many years were the subject of litigation in this country, and it was not until after 1880 that the decision was given against the patentees. Pierre Martin died at an advanced age, in an obscure French village where for many years he had lived in poverty. His last days were made comfortable by money raised by public subscription in Europe.—H. H. Campbell, in "Iron Age."

## THE DUPLEX PROCESS.

As generaly employed in the steel industry the Duplex Process, it is a combination of the acid Bessemer and the basic open-hearth processes. The acid converter oxidizes the silicon, together with the manganese and a certain portion of the carbon, the exact amount depending upon the practice. The blown metal is then transferred to the basic open-hearth furnace where the phosphorus and the remainder of the carbon is removed.

The Duplex process shortens the open-hearth purification by more than five-sixths of the usual period, giving a steel of the same quality as the straight open-hearth process.

The loss in the duplex process is greater than that in the straight open-hearth process, but this is largely due to the elimination of carbon, silicon, etc., in the converter, whereas the scrap in the ordinary open-hearth process has already withstood such a loss in its original conversion. To satisfy the slag in the Bessemer conversion, two per cent. of metallic iron is oxidized in the converter; this together with a small loss in "shot" and "spittings" are the only losses sustained in the duplex process not common to both processes, working with the same materials.—F. F. Lines.

## ROLE OF ALUMINA IN SLAGS.

There has always been a bias among metallurgists in favor of assigning to alumina the role of base in the composition of the slags. This has been natural, as the textbooks on mineralogy assign to alumina in the composition of the silicate minerals the role of a base, with very few exceptions. Hence, not questioning the correctness of this authoritatively assigned basic function of alumina, expressed as such in all the orthodox formulas of these minerals, it seemed only proper and correct to consider $Al_2O_3$ as a base in the artificial silicates, the slags. When this view played the mischief with the running of the furnace, this was ascribed to the innate depravity of alumina. You could support a little of it, but you must not allow too much of it, or it would get the better of you. That was about the practical conception in lead and copper smelting, using low furnaces, cold blast, low pressure, and under the necessity of keeping the fuel cost down.

Considering the composition and behavior of a number of slags it seems to me evident that in slags containing larger quantities of alumina, the alumina should be considered as an acid, replacing silica, and not as a base.—C. Henrich in A.I.M.E. Bulletin.

## MERGER RUMORS.

Gossip is again busy with the projected merger of the Dominion Steel Corporation and the Nova Scotia Steel and Coal Company. It is now suggested that the latter may double its capitalization, and that then an amalgamation might be arranged on a basis of share for share. All along it has been held that the merger, if it came about at all, would on a ratio of Dominion Steel for one of Nova Scotia. The market position of the stocks in question would appear to bear out this contention.

Sir Henry Pellatt has denied that he gave an option on 30,000 shares of Steel Corporation to the Ross-McKelvie Scotia Syndicate.

## CANTLEY ON SHIP BOUNTIES.

Colonel Cantley addressed the Maritime branch of the C. M. A. on steel shipbuilding. He said that the principle of bounty was practically accepted everywhere, but the method of calculation in Canada is obsolete and the amount too trifling.

"Our opinion is," said Col. Cantley, "that this bounty should be ten dollars per ton deadweight, calculated on say Lloyd's summer freeboard in the case of all sail or steam vessels. While in the case of steamers this should be supplemented by a further bounty of $2.50 per indicated horse power for the propelling machinery, provided such machinery, viz.: propelling engines and the boilers are the produce of Canadian workshops.

"Among the various systems and methods of assistance to shipbuilding adopted by different maritime nations, it would seem to us that in view of the present situation in Canada, that that of Japan is best calculated to meet our needs, which is practically that suggested above. During a period of twenty years the commercial fleet of Japan has increased from 360,000 to 1,500 000 tons. Practically all the ocean mail boats acquired by Japan in the last five years have been built at home, and these vessels of some 8,000 to 13,500 tons cargo capacity, and are mainly, but not exclusively, engined by machinery constructed in Japanese workshops.

The duration of the bounty should be not less than ten years and fifteen may be necessary, but the period for which the bounty is to apply should be clearly stated and embodied in the act so that prospective shipbuilders would know for a certainty just what bounty payments in the aggregate could be depended upon, and the capital expenditure on plant account that they were warranted in making.

## GRANBY.

An important construction and development program has been mapped out for the coming year by the Granby Consolidated management. One of the chief items will be the addition of a converter to present smelting facilities, which will permit of the constant operation of the existing four furnaces and will further increase smelter capacity to about 100,000 tons of ore monthly. The converter will cost approximately $300,000.

The new Granby has properties of excellent promise in and around Hidden Creek, its Pacific coast base. Development work on the Hidden Creek mine itself continues to show up very well, with new tonnages being constantly put into sight.

In one property, contiguous to Hidden Creek, at least 3,000,000 tons of ore have been shown up but not yet included in reserves. This ore will be treated by flotation, and experimental tests indicate a recovery of better than 90 per cent. The Midas mine in Alaska, which Granby bought several years ago, now ships from 3,000 to 4,000 tons of ore monthly. This averages 4 per cent. copper and carries about $3 per ton in precious metals values.

High labor and supply costs have visited Hidden Creek the same as at mines in the United States, and this has had the effect of increasing copper costs from this property alone to a 10-cent per pound average. Eventually, however, the management believes that Hidden Creek will develop into one of the low-cost producers. With the proposed converter in operation a cut of fully three-quarters of a cent per pound is anticipated.

The Grand Forks property, one of the first low-grade mines in America to be profitably operated, is limited in life and dependent to a very large degree upon the continuation of high copper prices. Costs at this section of the Granby property have run up to 17 cents a pound, but it should be borne in mind that copper content of the ore has dropped from around 20 pounds per ton to 13 pounds per ton. Every advantage has been and will continue to be taken of the present high copper metal market to handle every available ton of ore in the Grand Forks property, for with copper above 25 cents a pound handsome profits can still be shown even on this low-grade material.

From its Hidden Creek mine and others along the Pacific coast and its prospective smelting equipment, Granby eventually should be able to produce at least 40,000,000 pounds of copper per annum at a cost of nine cents a pound, even under present high wage scales and extraordinary high prices for supplies of all kinds.—Boston News Bureau.

## ALGOMA STEEL.

In a statement to the shareholders, Alex. Taylor, secretary of the Lake Superior Corporation, says:

"The Algoma Steel Corporation reports that for four months ending October 31, there were reproduced 131,600 tons of ingots and 82,500 tons of finished material. Production has not quite come up to expectations, due to labor difficulties generally. Conditions, however, are improving and the results for the last few weeks have been more satisfactory.

"The output is practically sold up for the ensuing year. At October 31 the Steel company had approximately 380,000 tons unfilled orders on hand, the tonnage preponderating being shell steel and steel rails. Prices are satisfactory but profits on war material cannot be as high as in the States from the fact that heavy duties plus war taxes are payable in Canada, and in addition it must be kept in mind that the price of steel rails has increased but slightly in comparison with other steel products.

"The end of the year should see the finish of the more important construction work. On account of labor conditions, it is doubtful if beyond a third 75-ton open-hearth furnace any attempt will be made to embark upon further new construction; the most formidable of which yet to be undertaken is, of course, the development of the mills."

## FERRO-PRODUCTS.

Ferro-silicon and ferro-phosphorus were produced in Canada in electric smelting plants during 1915, the latter in small quantities only. Ferro-silicon, 50 per cent., 75 per cent., and 85 per cent., was made at Welland, Ont., by the Electro-Metals, Limited, and ferro-phosphorus at Buckingham, Que., by the Electric Reduction Co., Limited.

The total production of ferro-alloys during 1915, was 10,794 tons, valued at $753,404, as against a production of 7,524 tons, valued at $478.355 in 1914, and 8,075 tons, valued at $493,018 in 1913. In 1912 the production was 7,834 short tons, valued at $465,225, and in 1911, 7,507 short tons valued at $376,404.

## DEVELOPMENT OF IRON MAKING IN THE UNITED STATES.

A bulletin entitled "The story of iron," which is to present a comprehensive review of the development of iron making in the United States, is nearly completed by J. L. W. Birkinbine, consulting metallurgical engineer. Its issuance in a few months is expected.

## STEEL OF CANADA.

At a regular monthly meeting of the directors of the Steel Company of Canada, Limited, a distribution of 4 per cent. was authorized on the ordinary shares of the company, to be paid out of earnings of the year 1916, on January 1st, 1917, to shareholders of record at the close of business December 16th, 1916.

At their meeting the directors authorized additional plant appropriations and considered the question of extension which will be incumbent upon the company to undertake in order to place it in a position to realize the fullest benefit from the expenditures and extensions already made and also having regard to the necessity of putting the operations of the company on the basis of the lowest possible cost of production to meet the competition which is inevitable when readjustment of trade conditions takes place.

## STEEL RAILS.

The annual production of steel rails in Canada has, since 1905, varied between 200,000 tons and 500,000 tons per annum, the greater part of which has been for home consumption, although during the past two years there has been some export, the quantity not separately recorded.

The annual imports of steel rails from 1895 to 1905 ranged between 50,000 and 212,000 tons, averaging about 125,000 tons. From 1906 to date, however, or since the establishment of rail mills at Sydney and Sault Ste. Marie, the imports have fallen to an annual average of 60.000 tons, the variation being between a minimum of 10,420 tons in 1915 and a maximum of 177,041 tons in 1913.

## DAVIDSON.

Announcement is made that Mr. D. R. Thomas, who has had seventeen years' practical mining experience, has been appointed mine manager of the Davidson Gold Mines, Limited, in Porcupine, and will be in charge of operations at the mine from now on. Mr. Thomas has recently been in the employ of the Moose Mountain, Limited, the big iron mining company at Sellwood, Ont., and is known throughout the Dominion as a very capable mining engineer. Prior to his connection with the iron industry, he was in charge of mining operations in British Columbia, and Mexico, where he had wide experience both in mining and milling of gold, silver and copper ores.

Mr. Frank G. Stevens, the new managing engineer of the Davidson, will divide his time between Toronto and Porcupine, so that he will be in direct touch with both the administrative and mining departments of the company.

## DOMINION MINES.

About two tons of high grade ore, running about twenty-five hundred ounces silver to the ton, have been bagged from the new vein found on surface at the Dominion Mines. The new vein runs east and west, cutting the Bilsky vein that runs north and south. The formation is Keewatin.

The new vein is from 1 to 3 inches in width and the ore shoot has been proved on surface for a length of 150 feet. Four or five other veins have been located, but these do not contain the same high grade ore.

When it becomes impossible to continue surface work the development underground of these and other veins will be undertaken through the old workings.

The Dominion Mines is owned by the Dominion Reduction Company.—Northern Miner.

## DOMINION STEEL.

With net earnings approaching 35 per cent. on the common stock, absolutely out of debt, the complete output for 1917 contracted for at fine prices, and that of 1918 also as good as sold, is the position of the Dominion Steel Corporation, semi-officially given out at the close of meeting of the directors. Although there was no official announcement, one of the directors stated that the chief business to come before the meeting was the announcement of the sale of the entire steel output of the corporation for the year 1917. This means more than the selling of the 1916 output, for the capacity of practically all the mills has been increased, and the increased output, with the enormous increase in steel prices, means that dividends on the common stock are coming rapidly within reach.

That the Steel Corporation is in a position to take full advantage of the general prosperity of the steel industry has been pointed out on several occasions by President Mark Workman, who points to their enormous ore and coal bodies as the real asset of the corporation.

When asked regarding rail business, a director stated that no rails were being manufactured at the present time, but that enquiries were coming in almost daily for rails for 1918E delivery.

## STEEL CO. PROFITS.

The Financial Times of Montreal is authority for the statement that, after a conference between the Canadian and American interests in the Dominion Steel Corporation, it has been practically decided to declare a dividend on the common stock in the course of a few weeks. The dividend, it is said, calls for 6 per cent. or better.

Discussing this phase of the situation, Mr. Workman says: "It is true that there is a good deal of cash available, business is very good, and it would be only fair to allow the shareholders to participate in the prosperity, but just when the directors will see fit to do this I cannot say."

The price of eight steel products across the line now average $70 per long ton for the first time in the history of the industry. When the average was in the neighborhood of $60 the ton interests identified with the trade asserted that quotations on various products were at or near the top, but just now there appears to be no steel man who is willing to say that the level will not be shoved still higher. The volume of new business in steel continues of record-breaking proportions in the United States, despite the great advance in prices, with many attractive foreign orders going begging for the reason that it is physically impossible for the mills to accept them.

## THE VISCOSITY OF SLAGS.

The fluidity of blast-furnace slags has for many years been the subject of much speculation and of theoretical deductions by operators and scientists, but no reliable conclusions had been reached because of lack of experimental data. The problem of measuring slag viscosity has been successfully solved, so far as the method, apparatus, and technique of measurement are concerned, through the development by A. L. Feild, junior chemist of the U. S. Bureau of Mines, of a new high-temperature viscosimeter. By means of this apparatus the viscosity of slags can be accurately measured up to a temperature of 2,900 degrees F., which is approximately 900 degrees higher than that used in previous viscosity measurements of any substance.

## ARMSTRONG, WHITWORTH OF CANADA, LTD.

Armstrong, Whitworth of Canada, Limited started manufacturing of special steels in the latter part of 1914. The crucible steel plant has a capacity of 7 tons every 24 hours. The electric furnace department has a present capacity of 15 to 18 tons of steel every 24 hours. Two 6-ton electric furnaces are being added.

In the electric furnace department are made special alloy steels, including vanadium steel, nickel-chromium, chromium, chromium-vanadium. The steel made from these furnaces is very free from sulphur and phosphorus, and some of the above combinations yield a tensile strength of over 200,000 lbs. per square inch. The uses of these alloy steels are very varied, including: pistons either forged or cast in form; steel for automobile parts; dies, stamps, wire drawing plates, plungers for hot drawing, etc.

Hammers in operation are from 400 weight up to 3 tons capacity. The company is at present installing a 500 ton steam intensifier hydraulic press, also one each of the following: 2,000 ton, 1,000 ton, 600 ton, 200 ton, 100 ton hydraulic presses. These are for the manufacture of locomotive and car wheel tires, rolled steel wheels, heavy forgings, etc.

The rolling mill department will include one 9 inch mill; one 12 inch mill, one 20 inch mill. These mills are primarily for the manufacture of high speed and carbon tool steel.

The small-tool department is the largest and best equipped in Canada. All the tools, cutters, gauges, etc., manufactured are made from steel manufactured by the company, and the range of small tools covers every type either in the United States or abroad.

There will be in operation the middle of next year a new plant for the manufacture of locomotive tires and wheels. The buildings for this new addition are now completed and the installation of special machinery has commenced. This addition will be capable of turning out the largest size locomotive tires and rolled steel wheels suitable for the various railroad and tramway companies.

## HOLLINGER.

A circular mailed out to shareholders of the Hollinger from the head office in Toronto, says in part: "In order to make provision for the payment of the indebtedness of $720,000 due the shareholders of Acme, Millerton and Canadian Mining and Finance Companies, the directors of Hollinger Consolidated Gold Mines, Limited, have decided to offer to its shareholders 120,000 of the company's treasury shares at $6.50 per share, the proceeds of which will not only take care of the indebtedness, but leave a substantial amount to apply towards wiping out the present deficit."

A further increase is shown in the production of the Hollinger Consolidated. In the regular four-weekly statement sent out by Mr. Percy Robbins, managing director, it is shown that, during that period, the gross profits were $241,591.70, as compared with $241,293.41 for the October period. The costs were $3.64 per ton, compared with $3.85 per ton for the preceding period. The mill ran 93.3 per cent. of the possible running time, treating 49,956 tons, compared with 49,770 tons for the October period, and the average value of the ore treated was $8.62 per ton, compared with $9.07. The milling costs were $1.061 per ton compared with $1.064. The greatest amount of ore was taken from the 200-foot level.

## FUTURE OF THE STEEL INDUSTRY.

Elbert H. Gary, president of the United States Steel Corporation, in an address before the American Iron & Steel Institute, had something to say about the present business, and the future prospects of the steel business. He said in part:

It is well known that the steel business in America is better than ever before. Our concern is only for the future. Many believe there will be a continuance of large business for many months or years after the war closes, others think there will be a material recession. No one can certainly foretell. Obviously the wise man will husband his resources, keep within safe limits and avoid over-extension.

## NOVA SCOTIA STEEL.

A despatch from New Glasgow, N.S., says that the Nova Scotia Steel and Coal Company has received a request from a large British shipbuilding company to supply it with its entire requirements of plates to enter into the construction of its ships. Before the war, these plates were secured largely from Germany, and were laid down on the English coast at a much lower price than they could be secured from either the United States or Canada. With so much business offering to the shipbuilding companies, many of them are anxious to effect arrangements that will result in their requirements being met at all times, and it is understood that this is one of the chief objects of the present visit of Col. Cantley to London. Roughly speaking, it is stated that this order would alone use up more steel than the Scotia Company is now using in all its undertakings for munitions work.

## TRETHEWEY.

The Trethewey Mining Company, which owns ninety per cent. of the stock of the Rochester mine, and which has also a long lease on the property, has been working through the shaft on the old Lumsden property. Most of this work has been done on the 290-foot level. Some narrow but promising veins were found, and some of them developed with varying results. The one upon which most attention is being given now is over an inch in width and near the contact some ore running 2,000 ounces to the ton was taken out, and about two waggon-loads shipped. At the original property near the town the mill is running and ore is being recovered from the old veins and stopes. The company had an option on the Lucky Cross property at Swastika, but after considerable exploration had been done dropped the option.

## SCHUMACHER.

According to F. L. Culver the Schumacher mine produced in November $8,295.60. Working costs amounted to about $15,000, leaving a small surplus. The heavy costs were due to the fact that a big development campaign is being carried out, including the sinking of the new shaft. During the month the shaft was sunk 63 feet to the 200 foot level. A station is being cut here and crosscuts will be started both north and south. The north crosscut is expected to cut a vein 40 feet from the shaft and to the south there is a vein about 60 feet away.

In the 115 drift on the 100 foot level the east face shows five feet of ore and on slashing the walls some excellent ore has been obtained.

# MR. DEWART ON GERMAN CONTROL OF METALS

At Belleville, Ont., on Dec. 6, Mr. H. H. Dewart, addressing the District Liberal Conference, made some interesting statements concerning German control of the metal industry, and the failure of Canada to prevent nickel from reaching the enemy. He said in part:

On Feb. 29, Mr. Meighen, as solicitor-general, from his place in the house of commons, stated: "I can categorically say to the house that not one pound of Canadian nickel has reached the enemy since the war began."

We know, and can prove to-day that this is not true.

What is the charge that we make, and how is it met?

1. We charge that the Deutschland has carried one cargo of Canadian nickel to Germany in August, and was loaded with another in November of this year, purchased in the United States "since the war began."

2. We charge that the Canadian and provincial authorities could have, and should have, taken measures to control our nickel output at Sudbury, from which the Deutschland's shipments came, and to secure its refining in Canada, as a Canadian industry.

3. We charge that the International Nickel Co. is an alien concern, with German affiliations and connections, and that the Merton firm in London, England, who are its export agents, are a firm with German and enemy affiliations, who should not now control, and never should have controlled the output and sale of our Canadian nickel.

4. We charge that the real reason for the failure to do anything in this crisis, which so imperatively called, and still calls, for action, lies in the close and sinister political connection, primarily of the Hon. Frank Cochrane, and secondarily of the Cochrane-Hearst-Ferguson combination with the International Nickel Co. We say it is evidenced by the fact that its subsidiary company, the Canadian Copper Co., has been allowed to escape without payment of an approximate $2,000,000 of taxation which it justly owes to the Province of Ontario under the Mines Taxation Act, and which the Hearst-Ferguson-Lucas-McGarry-Hanna-Pyne government has not only failed, but refused to collect.

There was no effort made to establish the refining of Canadian nickel in Canada which could have been enforced by the transfer of a unit of the New Jersey industry to Ontario within nine months after the war began by proper negotiation and pressure unless the International Nickel Company controlled the government.

The trouble was that the hands of the government were tied. They were relying upon the "friendly consent" and "friendly co-operation" of this alien corporation. There has not been one reason suggested by any apologist for the government for the nickel not being refined to the extent of our full Ontario output entirely in Great Britain and Ontario to-day.

Then we are told by Mr. Meighen that our nickel matte does not leave Canada without the license of the Canadian government. What good is the license of the government before the matte is exported when the control over it is lost as soon as it reaches the United States? It is not suggested that with this control there has been the least restriction placed upon the export of any portion of the nickel matte of the International Nickel Company to their own refinery in the United States or that one ton of it has been refined somewhere else than at the company's refinery in New Jersey.

What Mr. Meighen means by saying that the entire output of the International Nickel Company is under the control of the British Government's "Committee on Enemy Supplies" is something that will require a great deal of explanation as well as his suggestion of the approval of the British Admiralty and of the British Government.

Mr. Meighen's explanations now do not jibe with what Sir Robert Borden said last February in the house. It was the Canadian arrangements that had received the unqualified approval of the British authorities, according to him. In the same debate, according to Mr. Meighen, it was our arrangement with the International Nickel Company that was the effective safeguard upon which he relied. When Lord Cecil's earlier interview of the 14th October caused alarm it would be interesting to know what cable was sent to him to which he replied on the 22nd October, "That the British Government was perfectly satisfied with the precautions taken and arrangements made by the Canadian Government with respect to nickel." But another cablegram was thought necessary and the reply from the Hon. Bonar Law was received at Ottawa on the 29th November to Sir Robert Borden, through the governor-general, that the British Government had approved from the first of the arrangement made by the Dominion Government for refined nickel to American plants.

So the arrangement is not a British arrangement. The control is not British control. It is not the British Government's Committee on "Enemy Supplies" that is acting. The "arrangements" that are approved are those made in Canada, those referred to by Mr. Meighen in the house of commons last spring, and the only arrangements of which we have had any evidence were the inspection of the books by Mr. Graham Bell of the railway department at Ottawa over which the Hon. Frank Cochrane presides, his inspection being made with the "friendly consent" of the International Nickel Company.

The people are not satisfied with the "friendly consent" and "friendly co-operation" of the International Nickel Company, that has existed since the beginning of the war. Dr. Heinrich Albert, the fiscal agent of the German Government in the United States, was able to rely upon the same "friendly co-operation" when he was able, through German-Americans, to purchase in November of 1914 the nickel which went on the Deutschland in August last and the 360 tons with which it is now loaded on its way to Germany. We have been cursed both in Great Britain, in the United States and Canada with this "friendly co-operation" and "friendly consent" of alien enemies.

Mr. Meighen tells us that there has been a considerable import from the French penal colony of New Caledonia into the United States and that there is an American output as a by-product of copper ores in the United States, yielding approximately 100 tons a month. My information is that with the care that the French Government has taken when ever its resources are concerned, any New Caledonia ore that finds its way to the United States (formerly refined in Belgium) is refined by the United States Nickel Refining Company in New Jersey and goes to France, Russia and Italy. It is not refined by the International Nickel Company, nor is the nickel which is the by-product of the United States plants refined by the International

Nickel Co. The nickel or nickel matte refined by the International Company is our Sudbury ore. It is the ore of the International Nickel Company that was sold by that company to the fiscal agent for the German Government and that was loaded on the Deutschland. There can be no evasion, it was the product of our Sudbury mines. The indictment of The Providence Journal cannot be met by any flimsy alibi.

**The Merton Company.**

And now I come to the consideration of the Merton Company. "Can the Ethiopian change his skin or the leopard his spots?" Mr. Meighen thinks that he can. Let us see: The enemy firm of Merton & Company has undergone a change. The shares formerly held by German subjects are now held by British subjects. There is no doubt that changes have been made, that an attempt at reconstruction has been made, that the conditions in Great Britain may have led to the acceptance of this reconstructed firm for a lack of a better medium, but it is not a British firm even yet, and I shall give you reasons why no reliance should be placed in it by Canada, from authorities who will not be accused of being partisan:

No sooner-had Mr. Meighen spoken in Toronto than we had a series of boiler-plate articles in The Telegram, The Star and The News, evidently paid for, each in the same strain, each contained the same information dished up in a slightly different form. One was from a gentleman who had two brothers at the front. Then The Telegram had an interview with "one intimately in touch with the nickel situation." But the Cochrane organ had its interview with a gentleman "well informed as to the facts in connection with the control of the Canadian nickel and the supervision exercised, etc." It was the same interview wherever you found it, but even before The Toronto Star published it, good Simple Simon as it is, it had editorially stated that:

"The explanation of the whole situation, as given in a speech by Hon. Arthur Meighen, will probably satisfy most people, whose interest in the matter is not partisan, that the Federal Government has been in full consultation with the Imperial government in regard to the nickel policy followed during the war, that the policy followed is, in fact, Britain's policy which the administration assists in applying."

Now "this inspired" interview tells us in each case before the war Merton & Co. was controlled by German shareholders to the extent of 55 per cent. It bemoans the action of the prize court which "doomed Merton & Co. to suffer loss on these shipments of $1,500,000."

But we are told that the "British authorities" had to choose between maintaining the efficiency of the Merton & Co. organization for its own benefit or allowing that organization to disintegrate. The British Government decided to maintain the Merton & Co. organization. The kindly disposed British Government put in auditors to establish the value of the German holdings, our enemies were paid off on the basis of $1,000 for every $500 of par value in the shares that constituted the 55 per cent. of German ownership in the company. So that despite the laws against trading with the enemy the British Government permitted the German shareholders in Merton & Co. to get $2 for every $1 that they had invested.

Is the Australian Government satisfied in 1916 to renew relationships with Merton & Co.? Let us see.

On the same occasion on which Mr. Richard Reid, the Agent-General for Ontario, spoke on the 4th March, 1916, Hon. J. G. Jenkins, who was from 1905 to 1908 the Agent-General for South Australia in Great Britain, and formerly a member of the cabinet in Australia, spoke for Australia. He spoke as an imperialist of the school of Joseph Chamberlain, and said:

Hon. J. G. Jenkins: Reverting to the mineral trade that went to Germany, I may tell you that the government there saw practically what had been done, that contracts had been entered into with different companies in Australia, binding them for a certain number of years, and to suspend operations in case war broke out. In that they showed that they anticipated war. It was a very clever contract. But our Australian politicians said: "If these contracts are not illegal, we will make them illegal." And they passed an act of parliament to cancel them, root and branch. Have our people cancelled them here yet? Not yet. They are considering it. They are waiting to see. They are too good to be hurried, some of them. They want to be so exceedingly just and upright. They don't want to hurt the feelings of these pious German spelter manufacturers and bomb droppers. "We must look at it very cautiously," they say, "and we must do nothing which would create any impression that we are doing an injustice to these people. I do not believe for a moment that there is any injustice in endeavoring to do justice, which is what we want to do, and I hope there will be sufficient force brought to bear on our government to compel it to see the necessity of absolutely doing away with these unfair agreements with enemy countries.

I have a further witness to call. I call the Hon. W. M. Hughes, the Premier of Australia. He delivered a speech in the house of commons at a luncheon given by the United Kingdom of the Empire Parliamentary Association, the Hon. Bonar Law, secretary of state for the colonies, presiding. There have been such frantic appeals for the endorsement of Mr. Bonar Law recently that it is interesting to know what Mr. Hughes said in his presence with reference to this firm of Merton & Co., and the whole German situation. I make no apology for quoting his pregnant words in their entirety from The Empire Review, April 1916:

"Well, when war broke out, and Australia, in common with the rest of the Empire, rallied to the standard, it was found that the great metal industry of Australia, the source to which the Empire might have looked for a supply adequate even for its abnormal needs, was so completely dominated by German capital and German influence, that the choice seemed to be only between complete paralysis of the industry, shutting down of the mines, the throwing out of employment of thousands of workmen, or supplying these metals to those agencies of Germany through whom alone the Australian companies were permitted by their contracts to sell their products, and through whom alone Britain could buy them.

"The German agencies of whom I speak were not situated in Germany, but in London! They were legally considered, British firms. Actually, they were, for all practical purposes, German. Under the cloak of naturalization, our enemies were within the very heart of our citadel. For it is literally true, although it has been questioned, that for nearly twelve months after we were at war with Germany, the British Government could only buy Australian lead, or any other, from a German firm! It may be said that it was an English firm. Legally, it was and is so. In essence

it was German. It was a tentacle of that great German metal octopus that, with its heart at Frankfurt-on-Main, the headquarters of the Merton group, had got the earth in its grip. I am not concerned with the precise nature of the relations between the heart of the Frankfurt octopus and its London tentacles. They are immaterial. I am not concerned with appearance, but with reality.

"That in the great German commercial and industrial conquest of the earth, the way of the German was that of the serpent and the dove, I know very well they cooed soothingly, but wormed themselves into the heart of our citadels. They always assumed the nationality of the country they intended to despoil and betray. It was such a ridiculously easy thing to impose upon the generous hospitality which we extended to all the nations of the earth. In England, the Frankfurt group is represented by an "English" firm; in the United States, the octopus calls itself the American Metal Company, in Africa, the African Metal Company; and, in Australia, the Australian Metal Company. What is in a name? Nothing. Or in an oath? Nothing. They took the name best suited to serve their purpose and the oath of naturalization as lightly as other men say "Good-bye." The certificate of naturalization was to them a scrap of paper.

"I have mentioned lead and zinc but only because they are typical. When war broke out, German influence controlled all copper interests; it owned or controlled the spelter works in Great Britain. And this German taint ran like a cancer throughout the fair body of British trade and commerce. And it was daily spreading. What an intolerable insult to our pride as British citizens it was and is, that Germany should have such a hold over our trade, that we should have actually been compelled to buy the raw material for munitions from German agencies at prices practically fixed by them, and that we should have had to pay £90 to £100 for spelter in America, while Germany was able to get it at £30 and this spelter which she got at £30 was largely from Australian ores. To kill Englishmen and Australians too, with ammunition made from Australian ores, and at the same time to compel the British Government to buy its ammunition through German agencies at three times the normal price, was admittedly a masterstroke.

"Well, what are we going to do about it? To bewail the past is futile, but not to learn wisdom from the past is criminal."

The premier of Australia had a right to speak. He had acted and had acted promptly. He had shown himself keenly alive to the necessity of preserving Australian lead and zinc for Imperial use. But we did nothing with the vastly more important nickel that we should have controlled in Canada. In Australia, the power of the German metal trust was utterly broken.

Let me quote from The Montreal Daily Star of Nov. 2, 1916, from a special report by its Australian correspondent.

"The attack on the German metal octopus, which was first made by Prime Minister Hughes of Australia, has excited eager attention all over the world. It is not too much to say that the manner in which this campaign was instituted and carried out and pushed, in spite of tremendous obstacles, to a successful conclusion, first revealed the strength of the Australian prime minister, and no doubt introduced him to the world at large.

"It would take up too much space here to deal with all that Australia has done in ousting Germany from the metal industry, but some of the bigger details are briefly stated here. Following quickly upon the heels of the unmasking of Germany's position came in rapid succession a number of parliamentary acts which completely cut the industry out of the hand of Germany. And it is not too much to say that as far as Britain is concerned, never again will Germany control the metal market of the world."

Realize what this means. Our great sister dominion over the seas, the Commonwealth of Australia, took the lead and the over-burdened British Government was keenly appreciative of the relief that Australia gave her in the great emergency. What were the methods that Australia adopted? They included the cancellation of all mineral and metal contracts with enemy companies and firms, the dissolution of the lead and zinc combines in Australia that were controlled by Germany and the destruction of all enemy agencies controlling tin and all other metals.

It was a master stroke, for the previous German control had "affected not only the producer and the consumer in Britain and elsewhere, but by fixing the world's price for the metals and limiting output, it directly controlled and affected employment and wages." Such is the testimony of an impartial witness. What Australia did Canada could have done and should have done.

What was the result? Hon. Mr. Hughes was able to enforce a comprehensive scheme, covering the whole of Australia, whereby Great Britain became a buyer for at least ten years of all Australia's essential mineral products. Mr. Hughes did not ask the British Government to protect Australia. He protected Australia and the British Government, and in so doing rendered a magnificent service to the empire.

Has the Australian Government resented its action? Does it desire to return to the kindly care of the reincarnated Merton firm? The Toronto World, which has blazed the trail in this whole nickel investigation, published on Saturday last, the 2nd day of December, an extract from Lord Northcliffe's paper, The London Daily Mail, of important significance as to this very firm.

A question was raised in the house of commons on Nov. 8, 1916, regarding the status of the Merton Company, "with its two naturalized British subjects" who had changed their names from Langebach and Schwartz to Lang and Staton. The London Daily Mail cabled for Premier Hughes' view and the reply came in a cable message from Sydney, N.S.W.

The text is as follows:

Sydney, Saturday, Nov. 11.

With reference to Mr. Pretyman's answer in the house of commons on Tuesday regarding the application of Messrs. H. R. Merton & Company, metal brokers, for reinstatement on the ground that the German interest had been eliminated, Mr. Hughes, the premier, says:

"Messrs. Langebach and Schwartz are still enemy subjects, except for the cloak of naturalization. I do not hesitate to say that Merton's is an enemy firm, the naturalization being a shallow artifice deceiving no body who is not anxious to be deceived. The commonwealth government refuses to recognize them."

Mr. Hughes added that one condition of the zinc contract with Britain was that only British-born subjects should handle Australian metals and that therefore Mertons were clearly ineligible for reinstatement.

The inert Canadian Government must have learned that Australia would have no Merton dealings.

So it was necessary to get a certificate of character for this firm in Great Britain. Premier Borden appears to have sent an urgent message. The reply comes from the Hon. Bonar Law, who had presided, without comment, when Premier Hughes delivered his telling speech in London last spring. Let Sir Robert Borden take such comfort from the reply as he can. This is what Bonar Law now says, on the 29th of November:

"Mertons have eliminated the enemy holding in the company, with the approval of the board of trade. His majesty's government, therefore, utilized the services of this company, which have assisted in securing government control of metals. Such control, owing to pre-war conditions, could hardly have been secured without their help.

"(Signed) Bonar Law."

"Such control, owing to pre-war conditions, could hardly have been secured without their help." But the Gordian knot could and should have been cut here in Canada for we are in control of the situation. It was to Canada that Great Britain looked. Of course, our "arrangements" were approved. So were those that Australia adopted. But why did Canada not submit the same measures for adoption that Australia did? The way was made clear for us by Australia. Only a political reason can possibly account for Canadian impotence and inactivity.

There are others besides the Premier of Australia who will not tolerate the German Merton firm, or any other enemy firm with an English veneer. Men in public life in England speak out. Criticism is not considered a badge of disloyalty there. Men do not hang on to the government benches and defy public opinion. The present political crisis there is due to insistence that things shall be done right. It is not Liberal leaders, such as political flag-wavers like Mr. McNaught profess to despise, but the ultra-Unionists who are speaking out there, as we are speaking out here.

There is a great deal of feeling about the laxity of the government in eliminating German and enemy influence in this country. Let us not care about what was done in peace time. We have had our eyes opened now. Let us do what is necessary.

In the face of this mass of testimony, Sir Robert Borden must stop apologizing for the Merton firm, with the International Nickel alliance. It is not loyal enough for Australia. It bears the taint that Sir Edward Carson has exposed. "The unseen hand of the Hun" is now made visible to the people of Canada. The defence must be abandoned.

The clear evidence of The Providence Journal, tracing the nickel of the Deutschland's cargo to the International Nickel Company, and to our mines at Sudbury, stands unimpeached. Until they disprove or displace this testimony, there can be and there will be no confidence placed in either the Borden-Cochrane or Hearst-Ferguson government in their alleged "control" of the nickel situation.

This is no alarmist cry for partisan effect or advantage. We owe a duty to the men at the front. While they are fighting our battles at the front, we can at least protect their interests here. They will have a right to demand from us an account of our stewardship when they return. It is not even now too late to make tardy amends for past mistakes. As Sir Edward Carson says: "We have had our eyes opened now. Let us do what is necessary."

## GOLD MINES OF KIRKLAND LAKE DISTRICT.

The December 2nd number of the "Northern Miner" has a special article on "Northern Ontario's Second Gold Camp, Kirkland Lake." Some extracts from this follow:

There is now one dividend paying mine in Kirkland Lake, the Tough Oakes. The Tough Oakes was placed on a dividend basis a year ago and has already paid $260,750.

The biggest handicap to Kirkland Lake has been inability to secure sufficient electric power. The Kirkland Lake district is close to the height of land and therefore any water power developments in the vicinity must be small. A few months ago the Northern Ontario Light and Power Company started construction on a transmission line from Cobalt, where the company has a surplus. This line will be completed by February when the needs of the camp will be completely met.

Until the development of the Tough Oakes got well under way, there were many skeptics regarding Kirkland Lake, more than on Porcupine in its same stage. The camp is essentially different from Porcupine and probably most other gold camps. The veins are narrow as far as quartz goes, values running sometimes several feet into the country rock, though the developments on the 300 foot level of the Kirkland Lake Gold Mines, where a body running about forty-five feet wide was cut, would indicate that the narrow quartz leads cannot be considered a rule. Practically all the veins found though have shown very little quartz, a large percentage of gold being in the country rock. The ore shoots are as a rule exceedingly rich. Some fine specimens showing free gold.

The Tough Oakes mill treats about 120 tons of ore a day. This ore averages around twenty three dollars per ton, or considerably over twice the average value of ore treated in Porcupine. On the other hand costs are considerably higher because of the selective mining policy that has necessarily been adopted. When more power is available in February, and auxiliary power developed by steam fuel costs about $100 per horse power, a big development program will be launched. More drills have been put in operation on development work recently, but considerably more will be in commission then.

The present development of the Tough Oakes is to a depth of 500 feet. The Sylvanite, adjoining the Tough Oakes, will be in operation shortly. The Wright Hargraves, further west started up a short time ago and work to date has been very encouraging. The main vein was uncovered on surface and is showing up exceedingly well. The actual development of the property will be started shortly.

The Lake Shore, which up to recently was financed almost entirely by private capital, has developed a considerable quantity of ore. The mine was closed down in the summer to install a larger surface plant. Shortly before closing down an ore shoot of spectacularly rich ore was found on the 300 foot level. This is now being developed by a raise, which work is steadily adding to ore reserves.

The Lake Shore is one of the companies planning to build a mill in the Spring. It will probably be of about the same capacity as the Tough Oakes.

Adjoining the Lake Shore is the Teck-Hughes. Some time ago the Nipissing Mines took an option on the property but abandoned it, supposedly because of what was considered a high purchasing price. Since then directors and others interested in the Buffalo

Mines of Cobalt have accumulated considerable of the company's stock; bonds have been issued and a mill constructed. The mill will probably treat about sixty tons a day, though increased production was allowed for in its construction. While awaiting electric energy from Cobalt, the Teck-Hughes management has been steadily developing the property, connecting up different workings, and now quite a quantity of ore is ready for the mill. Most of the devlopment work has been done on the 200 foot level.

Less than a year ago the Beaver Consolidated of Cobalt took an option on the Kirkland Lake Gold Mines. At that time a shaft was down about 75 feet. This shaft was continued, cross-cutting and drifting to a depth of 400 feet. On the 300 foot level a remarkably large body of ore was encountered. In the crosscut it shows about forty-five feet of ore running around nine and ten dollars to the ton. This vein was also cut on the 400 foot level, and while it is hardly known yet what the vein will amount to at that depth, it has been broken into for several feet. So encouraged has the Beaver been by the result of its work that it is understood that the option will be taken up and a mill erected next summer.

Another Cobalt company, the La Rose, has optioned the Hurd claims south-east of the Lake Shore, and is preparing to test out the properties. A short distance to the west of that group, camps have been built by the recent purchasers, Rochester interests, on the Minaker claims.

The sale of the Elliott Bagshaw group to the same interest has been announced. These claims adjoin the Kirkland Lake Gold Mines. A plant will be taken in and the development of the property undertaken.

Further north the La Belle Kirkland Mines has been steadily developing its property at Goodfish Lake. That section is somewhat different from Kirkland Lake in that the veins are considerably wider. The development work carried on by the company has blocked out considerable ore and diamond drilling will be carried on during this winter. If diamond drill results at depth are as satisfactory as those met with in workings to a depth of about 300 feet, a mill will be built on the property next year. The gold is usually found in narrow stringers in sufficient quantities to make the whole milling ore of a good grade.

### MURRAY MOWGRIDGE.

A force of men have been at work for some time on the Murray-Mowgridge property at Wolf Lake. A road has been cut in from the railway for taking in machinery and supplies and timbers for the new headframe are being taken out and framed.

Plans are being outlined for the development of this splendid property on a big scale, which includes the deepening of the present shafts and developing from greater depth. Already there is a large body of ore assaying $10.05 developed on three sides. The veins will be proved to depth, after which it is proposed, as is the usual method of procedure, to erect a mill. It is probable however, that for sampling and testing purposes only a small 5 stamp mill will be erected on the property.

The property is situated on the shore of the lake so that an adequate water supply will always be available. The property is between three and four miles from the station at Bourke's and can be reached by boat from the railway.—Cobalt Nugget.

## PERSONAL AND GENERAL

Mr. J. E. Spurr and Mr. George R. Bancroft of the staff of the Tonopah Mining Co. Engineers, were in Telkwa, B.C., in the Omineca mining district, in November.

Mr. H. C. Carlisle of the staff of the Tonopah Co's Engineers, at The Pas, Manitoba, is taking a holiday in New York and Philadelphia.

Professor Wallace and De Sury of the Geological Department of Manitoba University will deliver a series of lectures on Geology and Mining in the Pas during December.

Mr. M. W. Summerhays, manager of the Porcupine Crown mine, examined the Tash-Orn property in the Kowkash district recently.

Mr. J. B. Tyrrell left Toronto Dec. 8 on a professional trip to the East Kootenay district, B.C.

Mr. J. G. Sipprell is at New Glasgow in the employ of the Munitions Board.

Mr. Geo. Guess is working on a nickel refining process at the University of Toronto. He has had considerable success. The work is for the Ontario Nickel Commission.

President A. A. Cole of Cobalt, Mr. D. B. Dowling of Ottawa, Mr. T. C. Denis of Quebec, Mr. J. C. Dresser and Secretary H. Mortimer-Lamb of Montreal, were in Toronto on Dec. 18 for a meeting of the Council of the Canadian Mining Institute.

Mr. D. R. Thomas has been appointed manager of the Davidson Gold Mine, Porcupine.

Mr. A. A. Cole, president of the Canadian Mining Institute, addressed a meeting of the Empire Club in Toronto on Thursday, Dec. 21, on the "Importance of the Mining Industry."

Mr. H. E. T. Haultain is spending a few days in the Ontario corundum district starting a corundum concentrator.

Mr. Wm. Motherwell, a flotation engineer, after making investigations in Kootenay district of British Columbia, early last month left that province for Baker City, Oregon.

Mr. L. W. Oughtred, for some time past assayer at the Consolidated Mining and Smelting Co's Highland concentrator, at Ainsworth, B.C., is now superintendent, succeeding Mr. A. G. Monkhouse, who has returned to Moyie, East Kootenay, to again take charge at the St. Eugene, where the concentrating plant is being put in order for a resumption of milling operations after a long period of idleness.

Mr. J. D. Galloway, assistant mineralogist for British Columbia, is back in Victoria after having spent several months in the field, making investigations into mining conditions in country situated between the western part of Omineca mining division and the Lillooet district.

Mr. Alex. Robinson, formerly operating the Carmi mine, near Beaverdell, in Greenwood mining division of the Boundary district, British Columbia, and now manager of the Columbia Turk mine, 38 miles from Davenport, Washington, was in Trail, B.C., last month, in connection with the smelting of ore being shipped from Davenport to the Consolidated Mining and Smelting Company's works, at Trail.

Mr. A. W. McCune, of Salt Lake City, Utah, who is developing several mining properties in Ainsworth and Slocan mining divisions of West Kootenay, was in

those districts in November on one of his periodical visits to British Columbia.

Mr. Wm. Gardner, of London, secretary of the Tyee Copper Co., left Victoria, B.C., early in December on his return to England, after having been on Vancouver island two or three months negotiating for either the sale of the company's smelting works at Ladysmith, V.I., or sale to United States men. It is understood the latter alternative has been accomplished.

Mr. W. J. Elmendorf, of Seattle, Washington, was in Victoria in the latter part of November advising the managing director of a mining company operating a promising mining property, situated in Portland Canal division of British Columbia, relative to its further development.

Mr. Paul W. Greyer, general manager, and Mr. Frank Breeze, superintendent, for the Columbian Mines Company, operating hydraulic placer-gold mines on Pine creek, Atlin camp, British Columbia left Atlin several weeks ago to spend the winter "on the outside," B.C.

Mr. Thos. R. Stockett, of Nanaimo, B.C., general manager for the Western Fuel Co., operating some of the most important coal mines on Vancouver island, went to San Francisco, California, late in November, on a business visit at the company's headquarters there.

Mr. J. H. Cunningham, of Ladysmith, Vancouver Island, B.C., who only recently returned from a visit to Nova Scotia, has resigned as manager of the Extension colliery of the Canadian Collieries (Dunsmuir) Limited, and has been appointed superintendent of the coal mines of the Nova Scotia Steel and Coal Co. He left Ladysmith for the East early in December. He has been succeeded at Extension by Mr. T. A. Spruston, who has been manager of the same company's No. 7 mine, Comox colliery, VI.

Mr. Ferd R. Wolfe, of Spokane, Washington, manager of the Florence Mining Co., operating a silver-lead mine near Ainsworth, British Columbia, was at the mine last month. With the further development of the mine in progress and the construction and equipment of the company's concentrating mill nearing completion, the approach of a period of profitable production is hailed with confident expectation.

Mr. M. H. Sullivan, for the last four or five years assistant superintendent of the Consolidated Mining and Smelting Co's smelting works at Trail, B.C., has resigned that position to become superintendent of the Bunker Hill & Sullivan Co's new smelting works at Kellogg, Idaho, for which place he left Trail in the latter part of November. Before leaving he was the recipient of presentations made by respectively, those who were his associates on the Consolidated Co.'s staff, and residents of the town of Trail. The former gave Mr. and Mrs. Sullivan a solid silver coffee and tea service and the latter a gold locket to Mr. Sullivan. Mr. George Murray has succeeded Mr. Sullivan as assistant superintendent at the Trail smeltery.

Mr. Wm. Sloan, of Nanaimo, Vancouver island, has been made Minister of Mines for British Columbia, taking that portfolio in the new Provincial Government which Mr. H. C. Brewster, Premier, has formed. The term of office of Mr. L. A. Campbell, of Rossland, as Provincial Minister of Mines, though not lengthy, was marked by much activity.

Dr. Henry Mace Payne, consulting engineer to the Consolidated Gold Fields of South Africa, at the end of November, gave an illustrated lecture on "Gravel Mining in the Klondike and Siberia," to a large audience in Spokane, Washington, under the auspices of the Northwest Mining Association.

Mr. Raleigh P. Trimble, who for several years has been actively associated with the development of mining properties in Omineca division, British Columbia, early last month left Prince Rupert, B.C., on his way south to spend a short time in Portland, Oregon.

Mr. B. A. Stimmel, testing engineer for the Consolidated Mining and Smelting Co., Trail, B.C., has gone to Chicago to watch the company's interests in connection with the treatment there of a quantity of lead bullion.

Mr. J. H. Rose, of Trail B.C., has been appointed metallurgist for the Mason Valley Mining Co. at its smelting works at Thompson, Nevada, for which place he left Trail early in December.

Mr. Henry S. Fleming, of New York, chairman of the executive committee of the Canadian Collieries (Dunsmuir) Limited, was at the company's offices in Victoria, B.C., during several days at the end of November.

Mr. Wm. Fleet Robertson, Provincial Mineralogist, and Mr. Thos. Graham, Chief Inspector of Mines, left Victoria, B.C., on November 30 for Fernie, Crow's Nest district, Southeast Kootenay, where they were to be joined by Mr. G. S. Rice, of the United States Bureau of Mines, who, with the consent of the Director, Mr. Van H. Manning, will conduct investigations, in connection with the "bumps" that have occurred in the Crow's Nest Pass Coal Co's Coal Creek mines, with a view to making recommendations to the British Columbia Department of Mines as to what part, if any, of the disturbed area, may be worked again in coal mining without risk of disaster and possible loss of life.

Mr. Fred B. Ely, for some time a field engineer for Gunn-Thompson Co., was recently in New York city whence he went to Vancouver, B.C.

Mr. Frederick K. Brunton, metallurgical engineer, who years ago was assistant superintendent at the British Columbia Copper Co's smelting works at Greenwood, B.C., and afterward went to Cripple Creek, Colorado, has resigned from the staff of the American Smelting and Refining Co. at Garfield, Utah, to become assistant superintendent for the Consolidated Arizona Smelting Co., at Humboldt, Arizona.

Mr. John V. N. Dorr has been awarded the John Scott medal by the City of Philadelphia, acting on the advice of the Franklin Institute, for the invention of his classifier, thickener, and agitator. Mr. Dorr is president of The Dorr Company, hydrometallurgical and wet chemical engineers, of New York city, and Denver, Colorado.

Mr. Frederic R. Weekes, who during the earlier period of exploration of the group of mineral claims situated on Copper mountain, Similkameen, B.C., now being extensively developed by the British Columbia Copper Company, was resident mining engineer directing operations, has returned to New York city after having recently been engaged in professional work in British Columbia and California.

Mr. Bernard MacDonald, at one time in charge of important mines in Rossland camp, British Columbia, and since then actively associated with large mining enterprises in Mexico, is reported with other prominent mining men to have left Parral, Chihuahua, Mexico, for the Pacific coast, to escape Villa bandits, at whose hands they did not expect any consideration if caught by them.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

While production operations continue to be adversely affected by a lack of sufficient coke, in Kootenay and Boundary districts, and by a shortage of power in the upper Coast district, it is still to be expected that both in quantities and total value of the minerals produced, the results for 1916 will show record figures, especially as regards value since there have again been increases in prices of some of the metals. The coal and coke totals will be unfavorably affected by the continued shortage of labor, both in the Interior and in the Coast coal fields, but the latter are making a good showing notwithstanding this drawback.

There is also good cause for satisfaction at the number of small mining properties on which development work is being done. In several of the older mining districts this change for the better is especially noticeable, and it may be expected that a result will be an increasing number of shippers of ore next year, as it shall be found practicable at more properties to transport ore to a railway for shipment to reduction works.

### EAST KOOTENAY.

It is stated that the Consolidated Mining and Smelting Co. has about 275 men working at its Sullivan lead-zinc mine, near Kimberley, Fort Steele mining division. In addition, the company is employing men at its St. Eugene mine and concentrator near Moyie, in the same division.

The threatened strike of coal-mine workers in the Crowsnest district of British Columbia and at most of the coal mines in Alberta where the mine employees are members of the United Mine Workers of America, took place on the night of November 26. At two mines, namely, at Corbin in British Columbia and at Drumheller, in Alberta, there was a probability of an interruption to mining coal being avoided. Corbin is said to be a non-union camp; beside, much of the coal mined there is handled by steam-shovel in open workings, there being a large deposit of coal occuring near the surface with very little cover. Telegraphed advices from Ottawa on November 30th indicated that work would soon be resumed, representatives of the mine operators and workmen, respectively, in conference with some of the Federal ministers and officials at Ottawa having come to an agreement under which the miners would resume work until the matters in dispute shall be arranged between the operators and employees.

### WEST KOOTENAY.

**Ainsworth.**—The Kaslo Kootenaian states that mining, or rather quarrying of ore at the Comfort mine, which is situated on the Bluebell peninsula, across Kootenay lake from the town of Ainsworth, is being continued with no diminishing of the extent or value of the ore body. Mr. A. D. Wheeler is well satisfied with the result of the work so far. Results from diamond drilling, already arranged for, will be a guide in determining the best means to be adopted for further working, and will, it is expected, indicate whether or not the erection and equipment of a concentrating mill will be warranted. As only handsorted ore is shipped to the smeltery, there is an increasing accumulation of milling ore on the dump. The Comfort and the neighboring Kootenay Chief claim are owned by the Ainsworth estate, and Mr. Wheeler has a contingent interest.

The Florence Mining Company's mill building at Princess creek, between the Highland mill and Woodbury creek, is almost completed and installation of the concentrating plant is in progress. The concentration department of the plant at Kaslo is now being operated, as well as the magnetic separation part which was started several weeks earlier. Good results have already been obtained from the latter and it is expected that a high-percentage recovery will be made by the concentrated machinery that has been installed.

**Slocan.**—About 30 men are working at the mine of the Consolidated Noble Five Company, above Cody, where a fine shoot of ore has been opened by a long adit to the vein and then a drift, at a depth of nearly 3,000 feet from the outcrop of the vein on the mountain above.

The new concentrating mill put in by the owners of the Surprise mine on the site of the old Ivanhoe mill, destroyed by fire in the summer of 1915, is reported to be operating. In 1915 the Surprise output of silver-lead and zinc ore was of a gross value of approximately $500,000. For about a year, though, there has not since been any production, mine operation having been restricted to further development pending erection and equipment of the concentrating mill.

The Norman Mines Co., a Spokane, Washington, syndicate, has taken under lease and option of purchase the Madison group, on Reco mountain, above Cody. The group consists of the Madison, Argenta, Great Eastern, and Mardon Fraction claims. No work has been done on these claims for a number of years, but when they were being worked there was shipped 400 to 500 tons of ore, stated to have averaged about 200 oz. silver to the ton and between 20 and 30 per cent. lead. There are five adits on the property, which is opened to 300 feet in depth. Cleaning out the old workings has been commenced.

**Nelson.**—Several weeks ago the manager of the Yankee Girl mine, near Ymir, gave the following information concerning that property. Another 100 ft. of work will probably open the vein in the granite at a depth of 1,300 ft. on the dip. This vein in the upper levels yielded ore containing an ounce of gold to the ton and a little lead and zinc. The quantity of lead was occasionally sufficient to be paid for by the smeltery. A stringer of ore cut recently contains 17 per cent. lead in addition to the gold. The mine has been opened at four levels. A shoot of ore having an average width of 5 ft. was intersected by a 1,400 ft. cross-cut adit; it was followed in a slate formation for 450 ft.; its gold value varied from $6 to $7 a ton. Mill runs have shown that this ore will yield readily to an inexpensive method of treatment with cyanide.

At the Foghorn mine, situated about nine miles east of Ymir, a diamond drill is being operated from the face of a 1,100 ft. cross-cut adit in the Foghorn mine. It is estimated that the vein will be reached at about 900 ft. from the face of the adit, and two-thirds of that distance had been drilled by the middle of November. The drilling is costing $4 a foot. The ore occurring on the Foghorn contains gold, similar in character to that in the neighboring Wilcox mine, on which much development was done two or three years ago.

**Trail.**—The Trail News says: When the electrolytic copper refinery of the Consolidated Mining and Smelting Co. at Trail was completed a short time ago, with

a capacity of producing about 10 tons of refined copper a day, it was thought to be ample for all present requirements. Already, however, the decision has been reached to enlarge the refinery, now the only one in Canada—and it will at once be made approximately 50 per cent. larger. The present copper refinery building is a steel and fireproof structure about 200 ft. long by 67 ft. wide. The length will now be added to sufficiently to allow of the copper-refining capacity being increased to about 15 tons of refined copper daily. Steel for the addition to the building is being prepared by the contractor, and the erection of the supplementary structure will soon be under way. It was found that with the product of the British Columbia Copper Co's smelting works at Greenwood, in Boundary district coming to Trail for refining, and more copper ore being received from across the International Boundary line for smelting, it would be well to have sufficient refining capacity to provide for whatever should come to Trail for treatment, additional to the copper output of the company's mines at Rossland. The British Columbia Copper Co's product is blister copper, about 98 per cent. fine and containing gold and silver as well. The electrolytic refining process at Trail separates these metals and gives refined copper, the gold and silver being parted from the residue.

### VANCOUVER ISLAND.

Considerable development in copper mining in Cowichan district, which lies about midway between the Nanaimo coal field and the southern end of Vancouver island, may be looked for before very long, according to the Cowichan Leader, published at Duncan, the chief town of Cowichan district.

Ore has been shipped to the Granby Co's smeltery at Anyox from the Finlay property, situated about six miles west of Cowichan station which is on the railway between Victoria and Nanaimo, and being worked under lease by an Italian miner, Joe Galli. The shaft has been sunk to nearly 100 ft. in depth, and the showing of copper ore has improved to such an extent that it is proposed to employ more men at getting out ore, and to improve the shipping facilities at Cowichan bay, to which place the ore has to be hauled by horse teams eight or nine miles.

Near the Finlay claims are the Bluebell group, owned by an English company, and the King Solomon, which some years ago was acquired by Philadelphia men. Both these properties have lain idle for several years, following development that did not open any considerable quantity of ore. It is stated that an adit on the King Solomon, already in 700 ft., will during the ensuing winter be extended to a distance of 1,000 ft. from its portal, with the expectation of finding ore before the additional 300 ft. to be driven shall be completed. There are at the King Solomon a compressor, saw mill, and mine buildings for the accommodation of manager and men.

### GENERAL NOTES.

News from the Lardeau is that many mining men have visited that district during the season now closing, with the result that several properties have been taken over and are now being developed. Lack of transportation facilities is a great misfortune, though since it prevents attention being given to anything but high-grade ores.

The Granby Consolidated Co's copper production in October was greater than in either September or August, having been 4,346,099 lbs. as compared with 3,440,035 in September and 3,218,847 in August. For the ten expired months of the year the total production has been 37,432,131 lbs.

As the silver cups offered by the Provincial Department of Mines for competition in the Kootenay and Boundary districts are only open to miners' first-aid teams, the Consolidated Mining and Smelting Co. has decided to offer suitable prizes for competition among all classes of men employed at its reduction and refining works. Particulars will be announced later; at present only a preliminary announcement is being made. The company some time ago facilitated the organization of Safety Committees at its Trail works and its Rossland mines. Now it will provide for similar first-aid competitions for its Trail employees as have already taken place between miners' teams at Rossland, and at which a team from its Le Roi mine won the silver cup offered by the B. C. Department of Mines for annual competition among mine employees.

## THE McINTYRE MERGER

President A. M. Hay, in a letter to shareholders of McIntyre Porcupine Mines, Limited, says in part:

After prolonged negotiations, your directors have secured options in favor of this company for the purchase of all the property, plant and assets of the McIntyre Extension Mines, Limited, and for the McIntyre Jupiter Mines, Limited.

When the purchase of a controlling interest in the McIntyre Extension property was effected, its value for mining purposes was considered problematical. The immediate object in purchasing control was to secure the right of operating through the Extension (Main) shaft for the deeper development of the McIntyre property on the north side of Pearl Lake, which shaft had then already been sunk to a depth of 665 feet, and was furnished with all the requisite equipment for operating to a depth of 1,000 feet.

The operations carried on since then through this shaft have proven the existence of large and valuable ore bodies at a depth of 1,000 feet, not only on the property of the McIntyre company, but also on the property of the Extension company.

To deal with these ore bodies to the best advantage without bringing the companies into conflict on the policy of development, mining and milling, it is obvious that these operations should be combined in one company.

The purchase of a controlling interest in the McIntyre Jupiter Company was made on very favorable terms at a time when the Jupiter Mines, Limited, (the former owner) was not in a position to finance the undertaking. When the deal was made, the value of the ore in sight on the Jupiter property, thus rendered available for treatment in the McIntyre Mill, justified the purchase, apart from the possibilities of further ore development.

Recent operations on the Jupiter property to a depth of 475 feet, and on the Extension property to the west of the Jupiter boundary, at a depth of 1,000 feet, indicate that the ore bodies on Jupiter ground will be found to extend through its entire length in or near the contact between quartz porphyry and basalt, which extends from East to West for a distance of more than 2,500 feet on the Jupiter property.

Mr. R. J. Ennis, Manager of the McIntyre company, has been very desirous for some time of having a

consolidation of all three companies brought about, in order to prosecute a comprehensive and economical scheme of development and operation, which can only be carried out to the best advantage by operating the three properties as one. The difficulties incident to the proper apportionment of costs and receipts when ore is hoisted from more than one mine through the same shaft and treated in one mill must be apparent to all.

The directors of all three companies visited the properties during the past Summer, and came to the conclusion that consolidation was very desirable provided satisfactory arrangements could be reached. The matter was the subject of several conferences which followed, and it was finally decided that an examination should be made by an independent engineer with the object of arriving at a basis for further consideration.

Mr. C. D. Kaeding, Managing Director of Dome Mines, Limited, whose ability and experience, particularly in recent years in the Porcupine Camp, eminently qualify him for the task involved, was entrusted with the examination. Mr. Kaeding has submitted an exhaustive report, which, together with recommendations subsequently made by him at a joint meeting of Directors, has been used as the basis for the proposed consolidation:

An option has been secured from the McIntyre Extension Company to purchase that company's property and assets of every kind for 294,000 shares of McIntyre Porcupine Mines, Limited, being equivalent to one share for every 3 1-4 shares of McIntyre Extension Mines, Limited, in respect of 955,501 fully paid shares, issued and outstanding in shareholders, other than McIntyre Porcupine Mines, Limited.

An option has also been secured from the McIntyre-Jupiter Mines, Limited, to purchase that company's property and assets for 316,298 shares of McIntyre Porcupine Mines, Limited, being equivalent to one share for every three shares of McIntyre-Jupiter Mines, Limited, in respect of 948,893 fully paid shares, issued and outstanding in shareholders other than McIntyre Porcupine Mines, Limited.

Special general meetings of the shareholders of these companies have been called for the purpose of considering, and, if approved, ratifying the options, and will be held prior to the special general meeting of shareholders of this company, which has been called to pass upon the options above mentioned.

In the event of these options being exercised by the McIntyre company it will receive the full benefit of all operations of the subsidiary companies from their inception down to the date of transfer, and all agreements and obligations existing between the companies will be cancelled.

In the case of the Extension company, an immediate revenue will be obtained from the valuable ore now being developed on the 1,000 foot level which will become available when the equipment and transportation facilities now being installed, are completed about the end of the present month.

In the case of the McIntyre Jupiter company, all profits earned from the beginning of operations will become the property of the McIntyre company, while its obligations to furnish further working capital for the separate operation of the Jupiter property will cease.

The share capital of the three companies presently existing is as follows:

| | Authorized. | Issued. |
|---|---|---|
| McIntyre Porcupine Mines, Limited..... | $3,000,000 | $2,999,985 |
| McIntyre Extension Mines, Limited.. .. | 2,500,000 | 2,500,000 |
| McIntyre Jupiter Mines, Limited.. | 2,000,000 | 1,898,893 |
| | $7,500,000 | $7,398,878 |

In the event of the company electing to exercise the options, its authorized share capital will be increased by one million dollars, of which 610,298 shares will be issued to complete the proposed purchases, leaving unissued 389,717 treasury shares, out of a total authorized capital of four million shares of the par value of one dollar each.

Your directors are satisfied that consolidation would not only facilitate the operation and administration of the properties, but would also materially increase their combined earning power, greatly to the advantage of the present shareholders in the McIntyre company.

The operating profits of the three companies for the months of October and November amount to over $140,000, from a daily average of 413 tons of ore milled. After the first of January, when the new aerial tramway from the main shaft to the mill should be completed and in operation, sufficient ore will be available from the McIntyre and Extension properties to supply the mill to its recently increased capacity. Later on, when the ore bodies on the north side of Pearl Lake have been developed to greater depths, and when the Jupiter workings have been connected up with the main shaft, the production of ore will undoubtedly warrant a further commensurate increase in milling capacity.

I have pleasure in stating that conditions at the mine and the financial position of the company are now such as to justify the payment of dividends in the near future, and it is the intention of your directors to declare a dividend in January next, whether consolidation is effected or not. In the event of consolidation being effected, out of the profits earned by the subsidiary companies, the proportion which would otherwise accrue to the minority interests therein, will more than provide for the proportion of dividend applicable to the stock proposed to be issued for the purchase of these interests.

In a letter just received from Mr. Kaeding, dated Reno, Nevada, 28th Nov., acknowledging one advising him the lines on which the directors had finally agreed, he writes:

"I consider the arrangement to be a most excellent one, which is in every way equitable and highly desirous. From the standpoint of the McIntyre company it will give them a property with a very large area known to be mineral bearing and situated in the highest grade section of the camp. The properties are so situated that the required plant can be centrally located and the minimum amount of development done to secure a maximum result. I feel so optimistic about the future of the McIntyre Consolidated company that I urge your shareholders to ratify this arrangement without loss of time, thereby enabling the mine management to lay out a clear cut programme for the future."

## COLUMBIA SECTION, A.I.M.E.

The Columbia Section of the American Institute of Mining Engineers, members of which are scattered over a wide extent of country covering Eastern Washington, Northern Idaho, and Kootenay and Boundary districts of British Columbia, held its annual meeting in Spokane, Washington, on November 25, when Mr. W. H. Linney, of Spokane, was elected chairman for the ensuing year; Mr. Oscar Lachmund, of Greenwood, B.C., vice-chairman; and Mr. L. K. Armstrong, Spokane (re-elected), secretary-treasurer. The retiring chairman, Mr. Stanley A. Easton, of Kellogg, Idaho, remains on the executive, to which Professor Solon Shedd, of the State College of Washington, Pullman, was also appointed. Messrs. Armstrong, Easton, and J. Cleveland Haas were appointed the committee on papers. Mr. C. G. Warfel, assistant professor of mining at the State College of Washington, read a paper relative to the electrical reduction of iron ore occurring in Washington and Idaho. Among other subjects discussed, flotation concentration had attention.

## OBITUARY.

The following obituary notice on the father of Mr. T. A. Rickard, of San Francisco, California, editor of Mining and Scientific Press, was printed in that journal on November 11: Thomas Rickard died on November 2nd at Wimbledon, London, at the age of 85. He was a son of Capt. James Rickard, who came to California for John Taylor & Sons in 1850 to examine the Mariposa grant. As the senior member of the firm of Rickard Bros. he will be remembered by the older generation. A Cornishman by birth, a keen observer, a remarkable linguist, and an engineer of world-wide experience he played a leading part in the profession thirty years ago. Before practising as consulting engineer he was manager of important mining enterprises in Italy, Spain, Russia, and South Africa. The older engineers will recall his fine presence and courteous manner, as well as his wide fund of information. To them the news of his death will come like a regretful echo from days now far in the background of events. He was the last and the eldest of five brothers, William Henry, Richard, Reuben, and Alfred, all of whom played a notable part in mining, in our West as well as in other regions. He is survived by three sons, T. A., Forbes, and Herbert, and by three daughters, one of them the wife of F. W. Baker.

## MINING ON VANCOUVER ISLAND, B.C.

Mr. S. I. Silverman, of Seattle, Washington, is now working two mines on the west coast of Vancouver Island, B.C., namely, the Jumbo, on Deer creek, and the Indian Chief, on Sidney inlet, both in Clayoquot mining division. Twenty-five men are employed and between 20 and 30 tons of ore is being taken down to bunkers daily. The ore on the Indian Chief contains bornite; the property was held for years by the late Hon. Edgar Dewdney, and was at one time under option of purchase to the Tyee Copper Co., which did a lot of development work on it.

Numerous other properties on the west coast are also being further developed, among them the Monitor, on Alberni canal, which had long been idle, and the Yreka and June group, both in the neighborhood of Quatsino Sound. The Merry Widow and Old Sport groups, situated in the Elk Lake region, Quatsino mining division, were under bond in 1913 to a Spokane syndicate, at the head of which were Messrs. Conrad and F. R. Wolfe, of that city. Later the bond was transferred to representatives of the Stewart Mining Co. Quite lately the Coast Copper Co. was incorporated to acquire these properties; it is understood that the controlling interest is now held by the Consolidated Mining and Smelting Company of Canada, Ltd., and that included in the plans for operating these properties is the provision of transportation facilities by the construction of a railway or surface tramway to tidewater.

In 1914 much work was done in road-making to allow of machinery being taken to the property, a 5-drill compressor was installed, and a lot of diamond drilling was done, there having been about 30 men employed.

The local mining record reported for 1915 that "the work done this year at the Old Sport mine, owned by the Quatsino Copper Company, Ltd., consists of driving a 500-ft. tunnel, which cut through a 25-ft. ledge of low grade copper ore at a depth of 135 ft. Stripping and crosscutting on surface exposes the ledge to the extent of more than 3,000 ft. The property shows up well under development, but, owing to some financial troubles, the company decided to suspend work in August." The Consolidated M. and S. Co.'s engineers have examined the property, so that it is evident they think well of it, since the company has since become interested in it, as above stated.

Numerous prospectors are working on the west coast, and some good showings of ore have been opened, but there is great need of miners for the development of properties where there is money available for doing this work.

## TORONTO MARKETS.

Cobalt oxide, black, $1.05 per lb.
Cobalt oxide, grey, $1.15 per lb.
Cobalt metal, $1.25 to $1.50 per lb.
Cobalt anodes, $1.50 to $1.75 per lb.
Nickel metal, 45 to 50 cents per lb.
White arsenic, 5½ to 6 cents per lb.

Dec. 11.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 15 cents per lb.
Lead, 9½ cents per lb.
Tin, 48 cents per lb.
Antimony, 18 cents per lb.
Copper, casting, 36½ cents per lb.
Electrolytic, 38½ cents per lb.
Ingot brass, yellow, 22 cents; red, 24 cents per lb.

Dec. 11.—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $9.00 per ton.
Coal, bituminous, $10.00 per ton.

## SILVER PRICES.

| | New York, cents. | London, pence. |
|---|---|---|
| November 23 | 73⅛ | 34 15/16 |
| " 24 | 73⅛ | 34 15/16 |
| " 25 | 73⅝ | 35 3/16 |
| " 27 | 74 | 35 5/16 |
| " 28 | 73⅞ | 35 5/16 |
| " 29 | 74⅜ | 35½ |
| " 30 | .... | 35 15/16 |
| December 1 | 75⅛ | 35⅞ |
| " 2 | 75¼ | 36 |
| " 4 | 75 | 35 13/16 |
| " 5 | 75½ | 36 1/16 |
| " 6 | 75⅝ | 36⅛ |

## MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% $MoS_2$, $14.00 per unit.
Ores carrying between 3% and 5% $MoS_2$, $16.00 per unit.

CANADA

# NATIONAL SERVICE

**PUBLIC NOTICE** is hereby given under the authority of the "War Measures Act, 1914," that during the first week in January, 1917, an inventory will be made by the Post Office Authorities, of every male between the ages of sixteen and sixty-five, residing in Canada.

National Service Cards and addressed envelopes for their return to Ottawa have been placed in the hands of all Postmasters for distribution amongst the persons required to fill in such cards. Every male person of the prescribed ages is required to fill in and return a card enclosed in an envelope within ten days of its receipt.

Any person who fails to receive a card and envelope may obtain the same upon application to the nearest Postmaster.

R. B. BENNETT,
Director General.

Ottawa, 15th December, 1916.

## THE NATIONAL SERVICE CARD

1. What is your full name?..... 2. How old are you?.....years.

3. Where do you live? Province.....
4. Name of city, town, village or Post Office .....
Street..... Number.....
5. In what country were you born? .....
6. In what country was your father born? .....
7. In what country was your mother born? .....
8. Were you born a British subject?.....
9. If not, are you naturalized?.....
10. How much time have you lost in last 12 months from sickness? .....
11. Have you full use of your arms?.....
12. Of your legs?..... 13. Of your sight?.....
14. Of your hearing?.....
15. Which are you—married, single or a widower? .....
16. How many persons besides yourself do you support? .....
17. What are you working at for a living?.....
18. Whom do you work for?.....
19. Have you a trade or profession?..... 20. If so, what?.....
21. Are you working now?..... 22. If not, why?.....
23. Would you be willing to change your present work for other necessary work at the same pay during the war?.....
24. Are you willing, if your railway fare is paid, to leave where you now live, and go to some other place in Canada to do such work?.....

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Curtis & Harvey (Canada) Ltd.
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## ALPHABETICAL INDEX TO ADVERTISERS


A

American Zinc Lead & Smelting Co. . . . . 5
Armstrong, Whitworth of Can., Ltd. . . . . 10

B

Bath, Henry & Son . . . . . 13
Balback Smelting & Refining Co. 13
Beatty, M. & Sons . . . . . 9
Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12
Berger, C. L. & Sons . . . . . 9
Blackwell, Geo. G., Sons & Co... 13
British Columbia, Province of.... 7
Buffalo Mines, Ltd. . . . . 4

C

Campbell & Deyell, Ltd. . . . . 11
Canadian Copper Co. . . . . 6
Canadian Explosives, Ltd. . . . . 14
Canadian Industry, Commerce and Finance. . . . . 3
Can. Ingersoll-Rand Co., Ltd. . . . . 1
Canadian Inspection & Testing Laboratories, Ltd. . . . . 11
Canadian Laboratories, Ltd. . . . . 11
Canada Metal Co. . . . . 12
Cohen, S. W. . . . . 11
Concentrating Ores by Flotation 4
Consolidated Mining & Smelting Co. . . . . 13
Coniagas Reduction Co., Ltd. ... 13
Constant, C. L. & Co. . . . . 13
Curtis's & Harvey . . . . . .Outside Back Cover

D

Dept. of Mines, Canada. . . . . .Inside Front Cover
Deloro Mining & Reduction Co.. 13
Diamond Drill Contracting Co. .. 4
Dominion Coal Co., Ltd. . . . . 9
Dominion Engineering & Inspection Co. . . . . 11
Dorr Co. . . . . 11
Dwight & Lloyd Sintering Co., Inc. 7

F

Ferrier, W. F. . . . . 11
Fleck, Alex. . . . . 9
Forbes, D. L. H. . . . . 11
Fraser & Chalmers, Ltd. . . . . 4
Fuller, A. S. & Co. . . . . 12

G

Gartshore, J. J. . . . . 4

H

Hassan, A. A. . . . . 11
Hendrick Mfg. Co. . . . . 6
Hersey, Milton Co., Ltd. . . . . 11
Heys, Thomas & Son . . . . . 11
Hitchcock, C. H. . . . . 11
Hull Iron & Steel Foundries, Ltd. . . . . outside back cover

I

Imperial Bank of Canada . . . . . 6
Industrial & Technical Press.... 2
International Molybdenum Co. .. 6
International Nickel Co. . . . . 6

J

Johnson, Matthey & Co. . . . . 11
Jones & Glassco . . . . . 10

L

Ledoux & Co. . . . . 11
Lymans, Ltd. . . . . 6

M

Murphy, Chas. J. . . . . 11
Mussens, Ltd. . . . . 10

N

Nova Scotia Steel & Coal Co....2 and 4
Nova Scotia, Province of. . . . . 8
Northern Canada Supply Co., Ltd. 7

O

Ontario, Province of . . . . . .Inside Back Cover

Q

Quebec, Province of . . . . . 8

S

School of Mining . . . . . 5
Segsworth, R. F. . . . . 12
Smith & Durkee Diamond Drill Co. . . . . 11
Smith & Travers Diamond Drill Co. . . . . 12
Smith, Sydney . . . . . 11
Spearman, Chas. . . . . 11
Sullivan Machinery Co. . . . . 2

T

Tyrrell, J. B. . . . . 11

# Ontario's Mining Lands

Ontario, with its 407,262 square miles of area, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals, 70 per cent. of the rocks being of pre-Cambrian age.

The phenomenally rich silver mines of Cobalt occur in these rocks ; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Helen, Magpie and Moose Mountain mines.

Many other varieties of useful products are found in Ontario :—cobalt, iron pyrites, arsenic, quartz, graphite, talc, feldspar, mica, corundum, molybdenite, platinum, palladium, actinolite, apatite, fluorite, salt, gypsum, petroleum and natural gas.

Building materials, such as cement, brick, marble, limestone, sandstone, trap, lime, sand and gravel, are abundant.

Ontario in 1915 produced over 44 per cent. of the total mineral production of Canada, or more than twice that from any other Province. The preliminary report of the Ontario Bureau of Mines shows the output of the mines and metallurgical works of Ontario for the year 1915 to be worth $57,532,844, of which the metallic production was $47,721,180. There were 79 producing mines, 62 of which operated at a profit.

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